

number of Formative and Archaic period sites; small rock art sites; and possibly protohistoric (immediately preceding recorded history) sites. No Paleoindian sites have been recorded along the corridor, and it is not likely that they would occur.

No data exist concerning the presence of potential traditional cultural properties along the proposed Klondike Flats pipeline route. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of their occurrence and estimated density on the site are low (on a scale of low-medium-high-extremely high) for traditional cultural properties associated with the Navajo Nation and medium for properties associated with the Ute Mountain Ute Tribe, White Mesa Ute Tribe, Southern Ute Tribe, and Hopi Tribe. The likelihood of their occurrence and estimated density are medium to high for properties associated with the Uintah-Ouray Ute Tribe (Fritz 2004).

### **3.2.18.9 Visual Resources**

The proposed pipeline route between the Moab and Klondike Flats sites passes through narrow Moab Canyon, just north of the Moab site (Map 4, Appendix C), and the gently rolling desert plains north of Moab Canyon to the Klondike Flats site (Maps 2 and 3, Appendix C). Moab Canyon, characterized by steep, rugged, red sandstone cliffs, has a visual resource designation of Class II (BLM 2003b) (see Section 3.1.15 for an explanation of visual resource classes). The natural environment in the canyon has been altered somewhat by a number of cultural modifications, such as US-191, the Cane Creek Branch rail line, an overhead transmission line, and several buried pipelines. For the most part, however, the dominant features within the canyon are not the cultural modifications but the imposing sandstone cliffs. North of the canyon, the rolling desert plains are designated Class III (approximately 70 percent of the route) and Class IV (approximately 10 percent of the route) (Map 4, Appendix C).

The desert plains are characterized by undulating topography that is scattered with small desert shrubs and grasses. The background scenery along the pipeline corridor in these Class III and IV areas is composed of moderately rugged red and beige sandstone mesas and cliffs containing predominantly horizontal and diagonal features. Near the Klondike Flats site, background scenery changes to the smooth, rounded, buff-colored bluffs of the Mancos Shale.

The route proposed for the pipeline is visible to travelers on US-191 for most of its length. An approximately 4-mile stretch of the route is not entirely visible from the highway but is visible to recreationists and other travelers on the county road (historic US-160) that parallels US-191 along Moab Canyon. The proposed south access portion of the pipeline route is visible to recreationists and other travelers on Blue Hills Road (CR-138).

## **3.3 Crescent Junction Site**

The proposed Crescent Junction disposal site (Crescent Junction site) is located about 2 miles north of the Crescent Junction interchange on I-70 and US-191. The site is about 31 miles north of the Moab site and covers several square miles of largely desert terrain that is bordered on the north by the prominent Book Cliffs. All drainage to the Green River, which ultimately flows to the Colorado River, is located several miles west of the site. Because no perennial streams or rivers are on the Crescent Junction site, aquatic ecology and surface water contamination and use are not discussed.

The Crescent Junction area is within the service territory of Utah Power, a subsidiary of PacifiCorp. The corporation maintains an existing three-phase distribution line that parallels CR-175, a frontage road between Crescent Junction and Cisco.

### **3.3.1 Geology**

The Crescent Junction site is along the south edge of the Uinta Basin, and rocks dip gently to the north toward the basin axis. The site also overlies the northwestern part of the ancestral Paradox Basin (Figure 3–1). Nearby to the north is an erosional escarpment that rises about 600 ft; this escarpment is known as the Book Cliffs.

#### ***3.3.1.1 Stratigraphy***

Mancos Shale bedrock is exposed in several places at the site. The site is underlain by 3,000 ft of Mancos Shale; the remaining 1,000 ft was removed by erosion. The Ferron Sandstone Member is about 60 ft thick and occurs in the lower 300 to 350 ft of Mancos Shale. Below the Ferron is the lowermost member of the Mancos, the Tununk Shale (see Figure 3–25).

The Dakota Sandstone underlies the Mancos Shale and is less than 100 ft thick in the Crescent Junction site area. It is likely the shallowest bedrock unit containing ground water. The Cedar Mountain Formation underlies the Dakota Sandstone.

Mancos Shale bedrock exposures are covered over much of the Crescent Junction site area by alluvial mud (Doelling 2001). This unconsolidated gray material, less than 20 ft thick, fills swales in the softest parts of the Mancos Shale and consists of silt, clay, sand, and minor fragments of sandstone. Along the west side of the site area, Quaternary stream alluvium, up to 20 ft thick deriving from Crescent Wash, covers the Mancos Shale (Doelling 2001). This material consists of sand, silt, clay, pebbles, and sparse cobbles adjacent to the Crescent Wash stream course, which heads in the Book Cliffs just to the north.

#### ***3.3.1.2 Structure***

The site is in the Paradox fold and fault belt of the ancestral Paradox Basin (see Figure 3–1). The geologic structure of the Paradox Basin is discussed in Section 3.1.1. The Book Cliffs, less than 1 mile north of the site, is an erosional escarpment on the south flank of the Uinta Basin. Mancos Shale at the site dips gently (less than 10 degrees) northward (from north-northeast to north-northwest) toward the axis of the subtle, northwest-striking Whipsaw Flat syncline. Northwest-striking normal faults defining a graben of the northwest extension of the Salt Valley salt-cored anticline are about 1 to 2 miles southwest of the Crescent Junction site. These faults are not exposed on the surface and reportedly have as much as 1,000 ft of displacement, as determined by oil test wells drilled in the area in the 1920s and 1930s (Fisher 1936).

A fault mapped in 1924 during oil exploration (Harrison 1927; Fischer 1936) is believed to extend into the southwest quarter of Section 27 in the Crescent Junction site area. More recent studies do not show this fault as having surface expression (Woodward-Clyde Consultants 1984; Doelling 2001). It is unclear what geologic features were used as evidence of the fault. Surface fieldwork and an additional search for well data in the area would be necessary to confirm the existence of the fault. No other lineaments or geologic structures were noted in the Crescent Junction site area from northern Paradox Basin mapping by Friedman and Simpson (1980).

### **3.3.1.3 Geologic Resources**

No oil and gas resources have been found in the Crescent Junction site area. The nearest known petroleum accumulation is in the Morrison Formation about 3 miles south-southwest of the Crescent Junction site. Exploratory drilling for gas is currently under way 1 to 2 miles west of the Crescent Junction site; results of this exploration are unknown. Historical drilling in the vicinity of the site indicates that the potential for oil and gas accumulations at the site is low.

Although potash resources are associated with the Paradox Formation about 3 miles south of the Crescent Junction site, the site is northeast of the Salt Valley salt-cored anticline, and thick saline deposits are not present.

Uranium and vanadium deposits, which are associated with the Morrison and Chinle Formations, have been found in scattered locations in the region. However, because of the depth of these formations (3,000 to 4,000 ft) in the Crescent Junction site area, exploration for such deposits is not economical. Copper and silver mineralization is known to occur in a few locations in the region in fault-related deposits in the Morrison Formation (Woodward-Clyde Consultants 1984). Exploration for these deposits would be uneconomical because of their great depth. Coal resources occur in the Book Cliffs just north of the site; however, they are in stratigraphically younger rocks (Mesaverde Group of Late Cretaceous age) than are present at the Crescent Junction site.

Black shales, such as the Mancos, are naturally enriched to above background concentrations in metals such as uranium, copper, silver, vanadium, mercury, arsenic, and gold. These metals likely originated in volcanic ash material that was deposited (and became bentonite) during deposition of the Mancos Shale. In a study by Marlatt (1991), sampling of Mancos Shale generally in the area between Salt Valley and the Book Cliffs found that gold content ranged from 30 to 100 micrograms per kilogram (parts per billion). These values are about 10 times the background levels but are much too low for economic extraction.

No sand and gravel deposits are present in the Crescent Junction site area. Potential deposits of such material are present just south of the Crescent Junction site area and also about 0.5 mile west of Crescent Wash (McDonald 1999). This material occurs as pediment-mantle deposits that cover Mancos Shale bedrock surfaces.

### **3.3.1.4 Geologic Hazards**

Montmorillonite clay is found in the Mancos Shale underlying the Crescent Junction site area. Changes in water content cause the clay to shrink and swell, which can lead to subsidence (Mulvey 1992). An example of current problems associated with this clay may be seen along I-70, just south of the Crescent Junction site. Portions of the highway that cross Mancos Shale require constant maintenance because of heaving of the concrete slab structures.

The low angle of slopes and homogeneity of the Mancos Shale bedrock preclude hazardous landslides, slumping, or rock falls. The site is sufficiently distant from the Book Cliffs that hazards from rock falls are not an issue.

Earthquake risk and seismic activity in the site area are low. The nearest faults with Quaternary movement that also have surface expression are about 2 to 4 miles southwest of the site and are

related to the northwest extension of the Salt Valley salt-cored anticline (Hecker 1993). These faults are associated with salt structures in the northern part of the Paradox Basin and salt-dissolution collapse that has occurred (Wong et al. 1996). The faults are considered to be unrelated to earthquake-generating tectonic forces and not seismogenic. Seismicity in this part of the northern Paradox Basin has a low rate of occurrence, with small- to moderate-magnitude earthquakes (Wong and Humphrey 1989). The site area is in Uniform Building Code 1, indicating lowest potential for earthquake damage (Olig 1991).

The site area has a moderate-to-high radon-hazard potential for occurrence of naturally occurring indoor radon based on the geologic factors of uranium concentration, soil permeability, and ground water depth (Black 1993). The moderate-to-high rating stems from the relatively high concentration of naturally occurring uranium in Mancos Shale, the relatively high soil permeability caused by shrinking and swelling of the Mancos-derived soil, and the relatively deep depth to ground water (shallow water retards radon migration).

### **3.3.2 Soils**

The soils at the Crescent Junction site are on the alluvial valley flats immediately south of the Book Cliffs. The area is dominated by the Toddler-Ravola-Glenton complex of soils. Because the Book Cliffs are composed mainly of shale and topped by sandstone, the Ravola family soils, which are strongly influenced by shale sediment, are probably the predominant family in the area. [Table 3–30](#) provides characteristics of these soils.

The Ravola family is derived from shale from the Book Cliffs and is therefore moderately to strongly saline. These soils are typically very deep and well-drained. The hazard of water erosion is moderate; however, the soils are subject to gully formation and piping where runoff is concentrated.

Also occurring within the soil complex is the Toddler family of soils, which formed from a mixture of marine shale and sandstone and is also very deep and well-drained. They are moderately to strongly saline. Runoff is slow, and the erosion hazard is moderate.

Formation of the Glenton soils is strongly influenced by sandstone sediment. These soils are very deep, are well-drained, and exhibit fairly rapid permeability. Runoff is moderate to slow and erosion hazard is relatively low; however, deep gullies have formed in areas where runoff is concentrated.

Mack loam soils, associated with 2- to 6-percent slopes, are formed similarly to Toddler-Ravola-Glenton soils from alluvium derived from sandstone and shale from the Book Cliffs. They are also similar in that they are very deep and well-drained. However, these soils are composed of more loam-textured soils and therefore support a different plant community. They also have a slight, rather than moderate, water erosion hazard.

Soil materials consist of more than 60 inches of the Toddler-Ravola-Glenton family soil. This series consists of low plasticity sandy clay and silts with good infiltration characteristics. These soils are grouped into the Hydrological Group B characterized by moderately high infiltration rate with a low erosion potential (SCS 1989).

Hydrocollapse potential for these soils is low, and no subsidence areas are known to exist in the area. Conditions for liquefaction (that is, loose soils, soils with a high moisture content, and a source of vibration) do not occur, so liquefaction potential is considered low.

### **3.3.3 Air Quality**

#### ***3.3.3.1 Ambient Air Quality***

Air quality information specific to the Crescent Junction site is unavailable; however, it is expected to be similar to, or better than, that described for the Moab site because of its more remote location and lack of area development. Limited air quality data are available for the Green River, Utah, area approximately 20 miles west of the Crescent Junction site. Air quality data collected from this site are considered to be representative of the Crescent Junction site because of geologic and physiographic similarities.

Criteria pollutants (Table 3–4 and Table 3–5 in Section 3.1.4) routinely measured at the Green River station include total suspended particulates, sulfur dioxide, and nitrogen dioxide; pollutants not monitored are carbon monoxide, ozone, and lead. Measurements of pollutants at the Green River station from 1980 through 1985 were below applicable standards except for total suspended particulates, which exceeded state secondary standards (DOE 1985). There are no major sources of pollutants at the Crescent Junction site; therefore, pollutant concentrations are likely similar to those recorded at the Green River station.

The Green River area is classified as an attainment area under the NAAQS. No site-specific information is available for the Crescent Junction site. However, based on its proximity to Green River, the Crescent Junction site is also considered to be an attainment area according to these same standards.

#### ***3.3.3.2 Visibility***

Visibility information specific to the Crescent Junction site is unavailable; however, it is expected to be similar to that described for the Moab site. Because the Crescent Junction site is on a plateau, the range of visibility is expected to be greater in most locations than at the Moab site where visibility is impeded by natural geologic features. However, low areas and hills are present and could impede visibility.

### **3.3.4 Climate and Meteorology**

Climate statistics for the Crescent Junction site were obtained from Thompson Springs, Utah (5 miles east). This arid area is characterized by maximum average temperatures that range from 88 °F in summer (the maximum recorded summer temperature is 105 °F) to 46 °F in winter. Minimum average temperatures range from 60 °F in summer to 22 °F in winter (the minimum recorded winter temperature is –23 °F). The overall mean annual temperature is 52.8 °F, the annual average maximum temperature is 66 °F, and the annual average minimum is 39.7 °F (Ashcroft et al. 1992).

Mean annual precipitation is 9.2 inches, and the frequency of precipitation events greater than 0.125 inch is less than 10 percent. Most of the precipitation occurs as rainfall during the southwest monsoon season, July through September. Maximum daily precipitation of 2.00 inches

and maximum monthly precipitation of 3.99 inches have occurred in August. The potential annual evaporation is approximately 55 inches, which greatly exceeds annual precipitation (Robson and Banta 1995).

Wind speed and direction data are currently unavailable for this site. For the purposes of this EIS, the data compiled from the Canyonlands Field Airport for the Klondike Flats site have been used (see Section 3.2.3).

### **3.3.5 Ground Water**

#### ***3.3.5.1 Hydrostratigraphy***

Unconsolidated alluvial material that is less than 20 ft thick along Crescent Wash consists of silt, clay, and minor fragments of sandstone. This material occurs just west of the site and overlies the Mancos Shale bedrock.

Bedrock at the Crescent Junction site is the upper part of the Mancos Shale; approximately 3,000 ft of the formation underlies the site. The Mancos Shale in the area consists of thin siltstone, fine-grained sandstone, and bentonitic interbeds widely spaced in the thick calcareous mudstone (Chitwood 1994). The Ferron Sandstone Member is about 60 ft thick and occurs in the lower 300 to 350 ft of the Mancos Shale (Blanchard 1990).

The Dakota Sandstone of the Late Cretaceous age underlies the Mancos Shale and consists of less than 100 ft of sandstone, conglomeratic sandstone, and shale. The Dakota Sandstone is deeper than 3,000 ft beneath the surface. The Cedar Mountain Formation of Early Cretaceous age underlies the Dakota Sandstone and consists of several sandstone and conglomeratic sandstone beds along with thick mudstone layers.

#### ***3.3.5.2 Ground Water Occurrence***

No usable ground water is available in the thin alluvial deposits of Crescent Wash just west of the Crescent Junction site area.

The Ferron Sandstone Member of the Mancos Shale is not a water-bearing unit. The Mancos Shale overall does not yield ground water and forms an aquitard that inhibits ground water migration to deeper stratigraphic units (Blanchard 1990).

The Dakota Sandstone likely represents the shallowest bedrock unit containing ground water beneath the Crescent Junction site. Ground water is also present in the sandstone and conglomeratic sandstone beds of the Cedar Mountain Formation. Water in the Dakota Sandstone and Cedar Mountain Formation may be under slight artesian head from recharge to the north along the north edge of the Uinta Basin. Additional studies may be necessary to identify quantity yields from these formations.

#### ***3.3.5.3 Ground Water Quality***

Inferred ground water quality for the Dakota Sandstone in this area is based on information from a well approximately 5 miles northeast of the proposed site, which had a TDS content of 1,800 mg/L (Blanchard 1990). This represents drinking water quality based on the Utah Ground Water Quality Protection program (Class II aquifer) (UAC 2003a).

#### ***3.3.5.4 Ground Water Use***

The current known source of water used by residents in the Crescent Junction area is from Thompson Spring, near the town of Thompson Springs. Additional studies may be necessary to confirm uses.

### **3.3.6 Surface Water**

#### ***3.3.6.1 Surface Water Resources***

No perennial water bodies are present within the Crescent Junction site area. Surface water resources within this area are limited to storm water runoff flows within the various ephemeral washes that transect the area. The courses of the ephemeral water bodies in this area are well-established and are unlikely to migrate in a different direction or pattern. Two washes just west of the site are Crooked Wash and Crescent Wash. Several smaller washes are present in the east part of the site that are tributaries of Thompson Wash. All of these washes flow south to southwest and are tributaries of the Green River. The ephemeral washes located on the Crescent Junction site are ungaged. Extreme floodwater surface elevations or the effects of extreme storm events are not currently known.

#### ***3.3.6.2 Surface Water Quality***

Soils associated with the Mancos Shale are alkaline and may have high concentrations of selenium. As a result, surface water in these ephemeral washes likely has high salinity, high turbidity, considerable hardness, and elevated levels of sulfate and selenium.

#### ***3.3.6.3 Relevant Water Quality Standards***

All ephemeral water bodies within the Crescent Junction site area are tributaries of the Green River; therefore, they are subject to the water quality classifications specified in Utah Administrative Code R317-2, “Standards of Quality for Waters of the State” (UAC 2003b) (see Chapter 7.0).

### **3.3.7 Floodplains**

Crescent Wash, an ephemeral stream, runs east of the Crescent Junction site and drains an area of 18 square miles. No floodplains exist at the Crescent Junction site, but it is prone to extreme surface flooding during precipitation events. The disposal cell would be located outside flood-prone areas of Crescent Wash.

### **3.3.8 Wetlands**

No known wetlands exist in or near the Crescent Junction site, but because riparian vegetation is present in places, the area would be investigated for any small, isolated wetlands prior to construction. Appendix F includes a further description of floodplains and wetlands at the Crescent Junction site.

### **3.3.9 Terrestrial Ecology**

This section describes the vegetation and wildlife aspects, including protected and sensitive species, for the Crescent Junction site. Although natural habitat is limited, it does exist for wildlife adapted to a desert environment, including some species of birds, mammals, and reptiles. The site topography is relatively flat, although steep rock mesas dominate the area to the north of the site, which also influences available habitat.

#### ***3.3.9.1 Terrestrial Vegetation and Wildlife***

In most areas of the site, vegetation is indicative of a disturbed site and varies from the potential native vegetation. About 50 percent of the Crescent Junction site area is covered by low-growing vegetation. The northern part of the site is covered with a gray veneer of debris from a recent outwash originating in the nearby Mancos Shale hills. The outwash area is mostly bare with some prickly pear cactus, cheatgrass, and Russian thistle. Vegetation in the south-central and southeast areas of the site also consists primarily of species such as Russian thistle, cheatgrass, and prickly pear with a few native shrubs and perennial grasses, including Gardner saltbush, galleta, and Indian ricegrass. The range condition of this area would probably rate as poor to fair.

Shrubs include black greasewood, shadscale, and Gardner saltbush; an understory consists primarily of annual weeds such as cheatgrass and Russian thistle with a few perennial grasses (galleta and Indian ricegrass). [Table 3–31](#) lists characteristics of the potential natural vegetation.

Black greasewood, an obligate phreatophyte, dominates the plant community in this area and accounts for the relatively high productivity. Occasional saltcedar (tamarisk) occurs in the drainages. Toddler family soils provide the structure to support Gardner and mat saltbush vegetation.

Wildlife population diversity and densities are limited in the Crescent Junction site area by the vegetation and habitat types present. However, large mammals such as the coyote and pronghorn antelope, adapted to a desert environment, likely occur in the vicinity of the Crescent Junction site. Smaller wildlife species adapted to a desert environment, including mammal, bird, and reptile, are also present. Coyote, mule deer, and bobcat may use the deep gullies as protection while traveling. Crescent Wash is near the site and may provide enough water near the surface to support low-density cottonwood trees that can serve as nesting and roosting sites for raptors, horned lark, sparrows, and other birds. The deep gullies are used as nesting sites for swallows. Coyote, white-tailed prairie dog, desert cottontail, and black-tailed jackrabbit may also use this habitat for food and cover. Raptors such as red-tailed hawks, golden eagles, and harriers use the area as a hunting ground. The presence of human activities close to I-70 may serve as a limiting factor in the density of wildlife species in this area. No critical habitat has been identified for wildlife at this site.

#### ***3.3.9.2 Species Listed Under the Endangered Species Act***

This section describes federally listed terrestrial threatened and endangered, proposed, or candidate species that are or may be present in the Crescent Junction disposal site area. In March 2003, DOE requested an updated list of such species from USF&WS that may be present or affected by DOE's proposed alternatives. USF&WS responded in April 2003 with a list for Grand County. [Table 3–32](#) lists a subset of those species that may occur in the vicinity of the Crescent Junction site.

Spatial data for the species listed in Table 3–32 were obtained from the Utah Conservation Data Center (UCDC). This data set was compiled by the Utah Natural Heritage Program (UNHP) of UDWR, in which species occurrences are depicted as points at a scale of 1:24,000 on 7.5-minute topographic quad maps. Spatial data depicting the Crescent Junction site were overlaid on the species of concern spatial data to evaluate known species occurrences in the area.

The status of each of these species in the vicinity of the Crescent Junction site is briefly discussed below. Appendix A1, “Biological Assessment,” provides more detailed information concerning these federally listed species that may be in the vicinity of the Crescent Junction site or could be affected by activities at the site.

There is a cluster of known populations of Jones’ cycladenia on BLM land in Grand County approximately 11 to 17 miles northeast of Moab (UDWR 2003b). However, there are no known occurrences of the species on the Crescent Junction site.

UDWR (2003b) reported an unconfirmed ferret sighting in the vicinity of the Crescent Junction site in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the Crescent Junction site.

Numerous white-tailed prairie dog (currently under review for federal listing) colonies ranging in size from 10 acres to 2,445 acres occur around the Crescent Junction area (Seglund 2004). It is unknown to what extent individual colonies or a combination of colonies could support black-footed ferrets.

The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas. However, it is not known to nest or night roost nor is it known to have been observed in the vicinity of the Crescent Junction site.

Mexican spotted owls were historically reported to occupy the Book Cliffs to the north of the Crescent Junction site but have not been observed in the vicinity recently (USF&WS 2001).

There is no designated or proposed critical habitat for any of the above federally protected species in the vicinity of the Crescent Junction site.

DOE, in consultation with USF&WS and BLM, would determine the need for additional habitat evaluations and surveys for species that may be affected by the proposed action should this alternative be selected.

### ***3.3.9.3 Other Special Status Species***

Special status species are those that are protected under federal and state regulations other than the ESA; these regulations include the MBTA, Executive Order 13186, and Birds of Conservation Concern (USF&WS 2002f). UDWR provided a list of species that DOE should consider in this EIS (UDWR 2003b). [Table 3–33](#) lists sensitive plant species that may occur in the site region. [Table 3–34](#) describes state-listed animal species. [Table 3–35](#) lists bird species protected under the MBTA and species listed as Birds of Conservation Concern.

Birds of primary concern are the peregrine falcon, red-tailed hawk, turkey vulture, burrowing owl, Swainson's hawk, and ferruginous hawk. Burrowing owl habitat may exist in the vicinity of white-tailed prairie dog colonies. Although burrowing owls have not been documented as occurring in the vicinity of this site, prairie dog burrows may provide suitable habitat for nesting.

### **3.3.10 Land Use**

The Crescent Junction site is located in Grand County on lands administered by BLM approximately 31 miles north of the Moab site. The area under consideration encompasses 2,400 acres of undeveloped land near the base of the Book Cliffs on a low-lying plateau named Crescent Flats. It is north and northeast of the I-70 junction with US-191 at Crescent Junction. Area land uses are shown on Figure 3-18.

Although not designated by BLM as a recreational area, the site has no access controls, and the area's hiking, biking, and camping uses are low. BLM has designated the Crescent Junction area as access-limited to existing roads. Favorable weather allows recreational access in virtually all seasons. Although no recreational use numbers are available for this area, hiking, biking, and camping use has been observed to be low. The southern boundary of the Floy Canyon Wilderness Study Area is approximately 2 miles north and northwest of the site.

Existing land uses include grazing, oil and gas leasing, and mining claims. The site is part of the Crescent Canyon grazing allotment, which is currently under a grazing permit until 2010. There are no mining claims on the proposed disposal cell location. Currently, all sections of interest for the potential Crescent Junction site are held by oil and gas leases. None of the leases are held by production. The existing oil and gas leases expire between 2008 and 2011. BLM has temporarily suspended further mineral, oil, and gas leasing at this site, pending completion of this EIS.

The proposed location of the Williams Crescent Junction Petroleum Products terminal and pumping station is adjacent to the southern boundary of the site. The terminal would consist of a 50-acre fenced site that includes storage tanks, a truck-loading rack, a vapor combustion system, an electrical substation, offices, and warehouse buildings. This facility would be served largely by truck traffic. Williams estimates the average daily throughput from the trucks to be approximately 10,000 barrels per day.

The nearest commercial property is a gas station and convenience store at the Crescent Junction interchange (approximately 1.5 miles south) located between I-70 and the Union Pacific Railroad tracks. This property has at least one full-time resident and may have as many as five residents during the busy summer season. Much of the property on the east and west side of US-191 is owned by the State of Utah SITLA. These State lands are currently up for sale and are subject to future commercial development.

The northern boundary of Arches National Park is approximately 9 miles southeast of the Crescent Junction site.

### **3.3.11 Cultural Resources**

The cultural history of the Crescent Junction site is discussed in the more general cultural history of southeastern Utah described in Section 3.1.13.1; the Class I cultural resource inventory that was conducted for this site is described in Section 3.1.13.2.

Results of the Class I inventory indicate that one linear Class III cultural resource survey, associated with a transmission line, has been conducted within the Crescent Junction site. On the basis of this survey, one prehistoric cultural site eligible for inclusion in the National Register of Historic Places has been identified within the boundaries of the site. The potential for cultural resources to occur on unsurveyed portions of the site is low. One predictive model based on soil type and landform (Berry 2003) indicates that an estimated 1.9 cultural sites per square mile could be expected to occur on the site.

No data exist concerning the presence of potential traditional cultural properties on the Crescent Junction site. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of occurrence and their estimated density on the site are low (on a scale of low-medium-high-extremely high) for traditional cultural properties associated with the Ute Mountain Ute Tribe, White Mesa Ute Tribe, Southern Ute Tribe, Navajo Nation, and Hopi Tribe. The likelihood of occurrence and their estimated density on the site are medium for traditional cultural properties associated with the Uintah-Ouray Ute Tribe (Fritz 2004).

### **3.3.12 Noise and Vibration**

The Crescent Junction site is located in a quiet desert environment where natural phenomena such as wind, rain, and wildlife account for most natural background noise. At times, insect activity and birds may account for significant portions of environmental noise. Sources of man-made background noise may include traffic on I-70, Union Pacific Railroad, aircraft flying overhead, and off-road recreation. Average  $L_{dn}$  would likely range from 22 dB on calm days to 38 dB on windy days (Brattstrom and Bondello 1983).

Neither background noise nor ground vibration data are available for the Crescent Junction site. Traffic noise from I-70 could raise the 1-hour  $L_{eq}$  to 55 dBA at the southern edge of the site. However, the background noise level from natural and man-made noise would average less than 50 dBA across the site.

### **3.3.13 Visual Resources**

The Crescent Junction site is located between I-70 and the towering Book Cliffs, a linear geologic feature that runs east-west on the north side of I-70 from Grand Junction, Colorado, to Price, Utah. The proposed disposal cell location is on flat to gently undulating, buff-colored ground that is sparsely vegetated with bunchgrasses and small shrubs. The steep, dissected cliffs of the Book Cliffs provide a dramatic backdrop to the north. Westbound and eastbound travelers on I-70, travelers stopping at a scenic overlook on eastbound I-70 (Figure 3-33), and patrons of the Crescent Junction gas station have a clear view of the proposed disposal cell location. The site is also visible from several residences, currently unoccupied, in the Crescent Junction area and from several residences on the west end of Thompson Springs, a small town 6 miles east of Crescent Junction. Visual resources are classified as Class III in this area (BLM 2003b) (see Section 3.1.15 for an explanation of visual resource classes).

### **3.3.14 Infrastructure**

The infrastructure supporting the Crescent Junction site is essentially identical to that described in Section 3.2.13 for Klondike Flats, except that the Utah Power three-phase distribution line that would supply the site runs along CR-175.



*Figure 3–33. View of the Crescent Junction Site from the I-70 Scenic Overlook*

### **3.3.15 Transportation**

Section 3.1.17 provides details of area federal, state, and county road and railroad use. Table 3–15 in Section 3.1.17 provides AADT, level of congestion, truck percent, and accident rates for US-191 from Moab to Crescent Junction and for I-70 in this area. Figure 3–21 shows the location of area roads and railroad lines. US-191 terminates at Crescent Junction and the I-70 interchange. Accident rates on US-191 are low, and it is not considered congested at this junction; however, accident rates on I-70 in the area are considered moderate. Both US-191 and I-70 are considered not congested in this area.

Several local county roads provide informal access to I-70 and area attractions or towns. These are also described in Section 3.1.17. CR-175 is a paved frontage road that connects Crescent Junction to Thompson Springs and other areas to the east. Two county roads, CR-233 and CR-234, begin just east of Crescent Junction and trend north into backcountry areas. They are dirt tracks and are not passable after heavy rains.

### **3.3.16 Socioeconomics**

Crescent Junction is approximately 31 miles north of the Moab site in Grand County, Utah (discussed in Section 3.1.18). It consists of a combination gas station and convenience store with several unoccupied former residences. The nearest town is Thompson Springs, which is 6 miles east of Crescent Junction, where temporary housing is limited to a few trailers and a campground.

### 3.3.17 Human Health

#### 3.3.17.1 Background Radon and Natural Radiation

The greatest hazard from natural radiation sources is inhaled radioactivity, mostly from radon-222 and its radioactive decay products in homes and buildings, which accounts for about 200 mrem/yr. Additional natural sources include radioactive material in the earth (primarily external radiation from the uranium and thorium decay series), radioactive material in the body (primarily potassium-40), and cosmic rays from space filtered by the atmosphere.

Section 3.2.16.1 discusses natural sources of radiation. The actual radiation dose from natural background radiation varies with location. On the basis of data from the Blanding, Utah, area, the radiation dose from cosmic and cosmogenic radioactivity would be about 68 mrem/yr at the Crescent Junction site. The radiation dose from external terrestrial radioactivity would be about 74 mrem/yr, and the radiation dose from radon-222 and its radioactive decay products would be about 260 mrem/yr (IUC 2003). The total natural background radiation dose at the Crescent Junction site would be about 440 mrem/yr, considerably higher than the national average of 300 mrem/yr (Table 3–36).

No one currently resides at the Crescent Junction site. Currently, one full-time resident lives near the gas station and convenience store (approximately 1.5 miles to the south), which is located immediately north of I-70 and east of US-191. As many as five residents have lived in the area during past summer seasons. According to 2000 census data, the population within 50 miles of the Crescent Junction site was about 10,200 (Figure 3–34). Assuming that all these people were exposed to 440 mrem/yr, the population dose would be about 4,500 person-rem per year.

Table 3–36. U.S. and the Crescent Junction Site Natural Background Radiation Doses

Source	U.S. Average Natural Background Radiation Dose (millirem per year)	Crescent Junction Natural Background Radiation Dose (millirem per year)
Cosmic and cosmogenic radioactivity	28	68
Terrestrial radioactivity	28	74
Internal radioactivity	40	40
Inhaled radioactivity	200	260
<b>Rounded Total</b>	<b>300</b>	<b>440</b>

### 3.3.18 Environmental Justice

Section 3.1.20 describes the legal basis for evaluating environmental justice and general census characteristics in Grand County. One census block within 50 miles of the Crescent Junction site is reported to have greater than 50 percent minority population; this census block is approximately 20 miles north of the Crescent Junction site (Figure 3–35). One census block group north of the Crescent Junction site shows a reported income of less than \$18,244 (poverty level for a family of four). It is located about 25 miles north of the Crescent Junction site (Figure 3–36). As discussed in Section 3.1.20, approximately 94 percent of Grand County was identified in the 2000 census as white, non-Hispanic.

### **3.3.19 Pipeline Corridor**

This section describes the proposed pipeline corridor between the Klondike Flats site and the Crescent Junction site. It does not repeat information from the Moab site to the Klondike Flats site (Section 3.2.18), unless the information is necessary to provide context for this discussion.

#### ***3.3.19.1 Geology***

Between the Klondike Flats site and Crescent Junction site, the proposed pipeline corridor passes over the lower and middle parts of the Mancos Shale for about 10 miles. The Mancos Shale contains expansive clay (montmorillonite) that shrinks and swells with changes in water content. No active faults or subsidence potential exists in the corridor.

#### ***3.3.19.2 Soils***

Soils within the proposed pipeline corridor are formed primarily on marine shale uplands and pediments and on alluvial fans and drainages consisting of sediments derived from nearby shale and sandstone uplands. Three general soil map units occur along this segment of the pipeline corridor from south to north: rock outcrop-Nakai-Moenkopi, Chipeta-Killpack-Blueflat, and Toddler-Ravola-Glenton (SCS 1989).

The potential natural vegetation on Nakai-Moenkopi soils include (1) the shrubs fourwing saltbush, shadscale, blackbrush, and winterfat and (2) the common grasses Indian ricegrass and galleta. Plant abundance and diversity on Chipeta-Killpack-Blueflat soils are very low, even for arid rangeland, because the low-permeability soils promote rapid runoff, have low available water capacity, and are often highly saline (SCS 1989). Potential vegetation consists primarily of low shrubs, including mat saltbush and Gardner saltbush with occasional shadscale and bud sagebrush. The potential natural vegetation of the Ravola-Toddler-Glenton soils is described in Section 3.2.8. Detailed descriptions of soil types and potential natural vegetation for this pipeline corridor are available in the SOWP (DOE 2003).

#### ***3.3.19.3 Ground Water***

North of the Klondike Flats site, the pipeline corridor passes generally over the lowermost part of the Mancos Shale, and ground water in the underlying Dakota Sandstone and Cedar Mountain Formations is at depths of 100 to 300 ft. For the last 3 to 4 miles to the proposed disposal site, the pipeline corridor passes over an increasing thickness of Mancos Shale, and the depth to ground water in the Dakota/Cedar Mountain increases gradually to about 3,000 ft at the Crescent Junction site.

#### ***3.3.19.4 Surface Water***

The proposed slurry pipeline corridor extending north from the Klondike Flats site to the Crescent Junction site would cross several washes (e.g., Klondike Wash and Thompson Wash) and a number of other smaller, unnamed drainage features, all of which are ephemeral. No perennial surface waters are present within this proposed pipeline corridor.

Storm water runoff in the local ephemeral streams is characterized by a rapid rise in flow rates, followed by rapid recession, primarily because of the small storage capacity of the surface soils in the area. The flows in these drainage features occur primarily in response to local heavy rainfall and, occasionally, snowmelt runoff.

### Water Quality and Existing Surface Water Contamination

Because there are no perennial surface waters, no data are available regarding contamination of existing surface water resources. When storm water flows through the washes within this pipeline corridor, the water is laden with sediment, and water quality is anticipated to be poor. These ephemeral washes collect surface water runoff primarily from areas composed predominantly of the Mancos Shale. Soils associated with the Mancos Shale are alkaline and may have high concentrations of selenium. As a result, surface water quality from these drainage features would likely be characterized as having high salinity, turbidity, and hardness and having elevated levels of sulfate and selenium.

### Relevant Water Quality Standards

All ephemeral water bodies in this pipeline corridor are eventually tributaries to either the Green River or the Colorado River; therefore, they are subject to the water quality classifications specified in Utah Administrative Code R317-2-13 (see Chapter 7.0).

#### ***3.3.19.5 Floodplains and Wetlands***

No floodplains or wetlands are known to exist along the proposed pipeline route. However, because the route may cross intermittent washes with riparian vegetation, such washes would be investigated for any small, isolated wetlands prior to construction.

#### ***3.3.19.6 Terrestrial Ecology***

Section 3.3.9 describes the affected environment for terrestrial ecology on a regional basis in the Crescent Junction site area (Maps 1 and 2, Appendix C). This section addresses only the areas, wildlife, and habitat that would be affected by the proposed pipeline corridor between the Klondike Flats and Crescent Junction sites. General information applicable to the species and site descriptions as described in Section 3.3.9 are not repeated in this section.

Approximately 10 miles of the route is aligned in relatively undisturbed areas. As was the case with the segment from Moab to the Klondike Flats site, habitat for mammals is limited by sparse vegetation along the segment from the Klondike Flats site to the Crescent Junction site. Large mammals adapted to a desert environment, such as the pronghorn antelope, are likely to be present intermittently in the proposed pipeline corridor.

Table 3–25 in Section 3.2.8 presents a list of federally listed threatened and endangered species that may occur in the vicinity of the Crescent Junction site. Appendix A1, “Biological Assessment,” provides more detailed information concerning these species. Of these species, the black-footed ferret and bald eagle, as described in Section 3.2.8.2 are the primary federally listed species of concern in the vicinity of the pipeline corridor between the Crescent Junction and Klondike Flats sites. In addition, the white-tailed prairie dog, currently in review for federal listing, is also of concern.

UDWR (2003b) reported an unconfirmed sighting in the vicinity of the Crescent Junction site in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur along the pipeline corridor between the Crescent Junction and Klondike Flats sites. The environmental assessment

conducted for the Grand County landfill (BLM 1995), which is located within 3 miles of the Klondike Flats site, concluded that there is no present or historical evidence of black-footed ferrets. Nevertheless, the black-footed ferret is of primary concern where potentially suitable habitat (i.e., prairie dog colonies) may exist along the northernmost sections of the route.

Numerous white-tailed prairie dog (currently under review for federal listing) colonies ranging in size from 10 acres to 2,445 acres occur around the Crescent Junction area (Seglund 2004). It is unknown to what extent individual colonies or a combination of these colonies could support black-footed ferrets.

The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas. However, it is not known to nest or night roost nor is it known to have been observed in the vicinity of the proposed pipeline corridor between the Moab site and the Crescent Junction site.

There is no designated or proposed critical habitat for any of the above federally protected species in the vicinity of the proposed pipeline corridor between the Klondike Flats site and the Crescent Junction site.

DOE, in consultation with USF&WS and BLM, would determine the need for additional habitat evaluations and surveys for threatened and endangered species that may be affected by the proposed action should this transportation mode be selected.

The burrowing owl (Cresto 2003), ferruginous hawk, peregrine falcon, and Swainson's hawk are not federally listed species, but they are included on the state list of sensitive species and are also protected under the MBTA. Because of previous sightings to the south of this site, it can be assumed that the peregrine falcon and ferruginous hawk may be present in the vicinity of the pipeline corridor.

#### ***3.3.19.7 Land Use***

The proposed pipeline route from the Klondike Flats site to the Crescent Junction site is approximately 13 miles. Approximately 33 percent of the route would be located on federal lands administered by BLM, approximately 15 percent would be on private lands, and the remaining 52 percent would be on lands under the jurisdiction of the State of Utah.

#### ***3.3.19.8 Cultural Resources***

The cultural history of this segment of the pipeline corridor is discussed in the more general cultural history of southeastern Utah described in Section 3.1.13.1; the Class I cultural resource inventory that was conducted for the proposed corridors is described in Section 3.1.13.2.

Results of the Class I inventory indicate that the segment of the pipeline corridor between the Klondike Flats site and Crescent Junction site contains approximately 20 known cultural sites that are either eligible for inclusion in the National Register of Historic Places or have been recommended as eligible. However, approximately 5 miles of the proposed route near the town of Crescent Junction have not been surveyed. The 20 sites include historic sites associated with transportation, mining, ranching, and agriculture; prehistoric lithic scatters of unknown affiliation; a small number of Formative and Archaic period sites; small rock art sites; and possibly protohistoric sites. No Paleoindian sites have been recorded along the corridor, and it is not likely that they would occur.

No data exist concerning the presence of potential traditional cultural properties along the pipeline corridor between the Klondike Flats site and Crescent Junction site. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of occurrence and their estimated density on the site are low (on a scale of low-medium-high-extremely high) for traditional cultural properties associated with the Southern Ute Tribe, Navajo Nation, and Hopi Tribe. The likelihood of occurrence and their estimated density are medium for traditional cultural properties associated with the Ute Mountain Ute Tribe and White Mesa Ute Tribe and medium to high for properties associated with the Uintah-Ouray Ute Tribe (Fritz 2004).

### **3.3.19.9 Visual Resources**

Visual resources along the Klondike Flats portion of the Crescent Junction pipeline route are described in Section 3.2.18.9. Visual resources along the remainder of the route, between the Klondike Flats and Crescent Junction sites, consist primarily of flat to gently rolling, light beige and light gray desert plains that are sparsely vegetated by saltbush and bunchgrass. The background scenery along this portion of the route varies. Along the east side of the corridor lie the rugged red and beige rocks of Arches National Park; along the west side of the corridor near the Klondike Flats site lie the smooth, rounded, buff-colored bluffs of Mancos Shale.

Approximately 3 miles north of the Klondike Flats site, the bluffs on the west side of the corridor come to an end and are replaced by the wide, flat expanse of the gray Mancos Shale desert. Visual resource designations along the entire route from the Moab site to the Crescent Junction site include Class III areas (approximately 80 percent of the route), Class IV areas (approximately 10 percent of the route), and the Class II area within Moab Canyon (approximately 10 percent of the route). Section 3.1.15 presents descriptions of the various visual resource classes.

The portion of the pipeline route from Klondike Flats to Crescent Junction is visible to travelers on US-191 for approximately 3 miles north of the Klondike Flats site. At that point, the route veers off to the northeast along an existing pipeline route and is not visible to the general public until it crosses I-70 near the town of Crescent Junction.

## **3.4 White Mesa Mill Site**

The proposed White Mesa Mill disposal site (White Mesa Mill site) is located in San Juan County, Utah, approximately 5 miles south of Blanding, Utah. Facilities consist of a uranium-ore processing mill, ore storage pad, and four lined tailings cells with leak-detection systems and ground water monitor wells. The facilities are situated within a 5,415-acre area of private property owned primarily by IUC. The mill itself occupies approximately 50 acres, and the tailings disposal ponds occupy approximately 450 acres. The site is accessible from a half-mile-long private road connected to US-191.

Since early 1997, the mill has processed more than 100,000 tons from several additional feed stocks. Since its inception, the mill has processed a total of 4,083,144 tons of materials. This total is for all processing periods combined. Annual production of yellowcake has been as high as 3.75 million pounds per year in the 1985–1990 period. In comparison, the Moab contaminated materials are estimated at 11.8 million tons and have an in situ dry density between 90 (slimes) and 97 pounds per cubic foot. A more detailed summary of White Mesa Mill operations is provided in Appendix G.

### **3.4.1 Geology**

The existing White Mesa Mill site is in the central part of the Colorado Plateau physiographic province known as the Canyonlands section. The site is located mostly on White Mesa, which slopes gently southward with elevations decreasing from about 5,700 to 5,400 ft. The southernmost part of the site is in a canyon that drops down to about 5,000 ft in elevation and contains an unnamed drainage that is a tributary to the Right Hand Fork of Cottonwood Wash. IUC (2003) provides a detailed description of the site geology.

#### ***3.4.1.1 Stratigraphy***

Bedrock at the site is covered by up to 25 ft of unconsolidated silt and very fine-grained sand. Some alluvial material (sand and gravel) may also be present in the eastern part of the area. A generalized stratigraphic column of the White Mesa Mill site is shown on [Figure 3–37](#).

In the north part of the millsite, the first bedrock formation present is a few feet of Mancos Shale. Below the Mancos Shale is the Dakota Sandstone, with an average thickness of 39 ft consisting mainly of sandstone and shale. Below the Dakota is the Burro Canyon Formation, which is approximately 75 ft thick.

Beneath the Burro Canyon is the thick Morrison Formation, which is composed of four members in this area. In descending order (from youngest to oldest) from the surface, the members and their respective thicknesses in the site area are: Brushy Basin, 275 ft; Westwater Canyon, 60 ft; Recapture, 120 ft; and Salt Wash, 100 ft.

The Summerville Formation, consisting mainly of siltstones, is below the Morrison. Below the Summerville are the thick Entrada and Navajo Sandstones. These sandstones were deposited mainly in eolian environments, are highly permeable, and form the principal aquifer in the region.

#### ***3.4.1.2 Structure***

The White Mesa Mill site is in the south part of the ancestral Paradox Basin, in the west part of the Blanding Basin subprovince (see [Figure 3–1](#)). Rock formations in the immediate area are nearly flat lying. At the millsite, bedrock dips generally 0.5 to 1 degree to the south (IUC 2003). No faults are known in the site area or within at least a 5-mile radius.

#### ***3.4.1.3 Geologic Resources***

No oil and gas resources are known to occur beneath the site. Evaporite deposits such as salt (halite) and magnesium salts (carnallite) occur in the Paradox Formation at the site; potash occurs farther north in the Paradox Basin. Recovery of these deposits would be uneconomical because of their great depth and the relative thinness of the deposits compared to other areas in the Paradox Basin.

Although uranium and vanadium deposits are known to exist 5 miles to the west and northwest of the millsite, the potential for these deposits on the site is low. Sand and gravel deposits may underlie the surface of the eastern part of the site (Gloyn et al. 1995). However, these deposits are probably scattered and insignificant (IUC 2003).

Age	Formation and Members	Thickness (ft)
Late Cretaceous	Mancos Shale	Up to 50 preserved
Early Cretaceous	Dakota Sandstone	30–50
	Burro Canyon Formation	60–90
Jurassic	Morrison Formation, Brushy Basin Member	275
	Morrison Formation, Westwater Canyon Member	60
	Morrison Formation, Recapture Member	120
	Morrison Formation, Salt Wash Member	100
	Summerville Formation	50–100
	Entrada Sandstone	300–500
	Navajo Sandstone	500–700
	Kayenta Formation	200
	Wingate Sandstone	300–400
Pennsylvanian to Triassic	Various formations from Pennsylvanian to Triassic age	2,000–3,000
	Paradox Formation	1,000–3,000

Figure 3–37. Generalized Stratigraphic Column for the White Mesa Mill Site

#### **3.4.1.4 Geologic Hazards**

Montmorillonite is present in the Brushy Basin Member of the Morrison Formation. As described in Section 3.2.1.4 and Section 3.3.1.4, changes in water content cause swelling and shrinking that can lead to subsidence. This hazard is a problem only at the edges of and on the slopes of White Mesa where the member is exposed. The Brushy Basin Member is 100 to 150 ft below the surface over most of the site and in the area being considered for a disposal cell; therefore, overburden pressures from the overlying formations and lack of exposure would prevent shrinking and swelling from becoming a problem.

The hazard exists for landslides and slumps in the canyons bordering the site where the Brushy Basin Member of the Morrison Formation forms unstable slopes (Harty 1991). Here, mudstones of the Brushy Basin Member offer little support to competent, thick sandstones of the overlying Burro Canyon Formation, especially in areas of seepage.

Earthquake risk and seismic hazard in the site area are low (Wong and Humphrey 1989). The site area is in Uniform Building Code 1, indicating the lowest potential for earthquake damage (Olig 1991).

The site area has a moderate-to-high radon-hazard potential for occurrence of indoor radon based on the geologic factors of uranium concentrations, soil permeability, and ground water depth (Black 1993). The high rating stems from the relatively high concentration of uranium in the Salt Wash Member of the Morrison Formation, the relatively high soil permeability caused by shrinking and swelling of the soils derived from the Brushy Basin Member of the Morrison Formation, and the relatively deep depth to ground water (shallow depth to water retards radon migration).

### **3.4.2 Soils**

The soil type in this area is primarily Blanding very fine sandy loam (USDA 1962), which is deep, well-drained, and of medium texture. The soil is moderately permeable and has slow surface runoff, so water can move through the profile readily and roots can penetrate easily. Because of the moderate infiltration characteristics, erosion potential is low. However, the flows resulting from thunderstorms are nearly instantaneous. When these soils are barren, they are considered to have a high potential for wind erosion.

Also occurring in small areas near the site is the soil type Mellenthin, a very rocky fine sandy loam (USDA 1962). This soil type is very similar to Blanding very fine sandy loam but is much shallower, often only 15 inches deep. The shallow depth influences the current and potential vegetation communities and, consequently, the wildlife habitat. It is also less suitable for reseeding because it has only moderate permeability, medium runoff, and low moisture-holding capacity. [Table 3–37](#) lists characteristics of the soil at the White Mesa Mill site.

### **3.4.3 Air Quality**

#### ***3.4.3.1 Ambient Quality***

Prior to construction of the White Mesa Mill, comprehensive evaluations of ambient air quality conditions at the millsite were conducted in the late 1970s and documented in the *Environmental Report, White Mesa Uranium Project, San Juan County, Utah* (Dames & Moore 1978), and also in the *Final Environmental Statement Related to Operation of White Mesa Uranium Project* (NRC 1979). This section summarizes these past investigations.

The State of Utah has adopted EPA standards for gaseous emissions and particulates as applicable throughout the state. Federal and state primary and secondary air quality standards are presented in Table 3–4. Primary ambient air quality standards define the relative air quality levels judged necessary, with an adequate safety margin, to protect the public *health*. Secondary ambient air quality standards define levels of air quality that are judged necessary to protect the public *welfare* from any known or anticipated adverse effects of a pollutant.

The White Mesa Mill site is located within the Four Corners Interstate Air Quality Control Region, which encompasses parts of Colorado, Arizona, New Mexico, and Utah. Air quality for any given area is evaluated according to a classification system that was established for all air quality control regions in the United States. The classification system rates the five major air pollutants (particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and photochemical oxidants) as having a priority of I, II, or III. A priority I rating means that a portion of the region is significantly violating federal standards for a particular pollutant, and special emission controls are needed. If the emissions are predominantly from a single point source, then it is further classified as IA. A priority II indicates a better quality of air in the region; a priority III rating classifies the highest quality. The priority classifications for the Four Corners Air Quality Control Region, which includes the White Mesa Mill site, are as follows:

	<u>Sulfur Dioxides</u>	<u>Particulate Matter</u>	<u>Nitrogen Oxides</u>	<u>Carbon Monoxide</u>	<u>Photochemical Oxidants</u>
Priority Classification	IA	IA	III	III	III

Ambient pollutant concentrations that define the classification system are outlined in [Table 3–38](#).

*Table 3–38. Federal Regional Priority Classifications Based on Ambient Air Quality*

Pollutant	Averaging Time	Air Quality for Each Priority Group <sup>a,b</sup>		
		I	II	III
Sulfur oxides	Annual 24 hour 3 hour	>100 µg/m <sup>3</sup> >455 µg/m <sup>3</sup>	60–100 µg/m <sup>3</sup> 260–455 µg/m <sup>3</sup> 1,300 µg/m <sup>3</sup>	<60 µg/m <sup>3</sup> <260 µg/m <sup>3</sup> <1,300 µg/m <sup>3</sup>
Particulate matter	Annual 24 hour	>95 µg/m <sup>3</sup> >325 µg/m <sup>3</sup>	60–95 µg/m <sup>3</sup> 150–325 µg/m <sup>3</sup>	<60 µg/m <sup>3</sup> <150 µg/m <sup>3</sup>
Carbon monoxide	8 hour 1 hour	>14 mg/m <sup>3</sup> >55 mg/m <sup>3</sup>	NA	<14 mg/m <sup>3</sup> <55 mg/m <sup>3</sup>
Nitrogen dioxide	Annual	>110 µg/m <sup>3</sup>	NA	<110 µg/m <sup>3</sup>
Photochemical oxidants	1 hour	>195 µg/m <sup>3</sup>	NA	<195 µg/m <sup>3</sup>

<sup>a</sup>In the absence of measured data to the contrary, any given region containing an area whose 1970 "urban place" population exceeds 200,000 will be classified priority I. All others will be classified priority III. Hydrocarbon classifications will be same as for photochemical oxidants. There is no priority II classification for carbon monoxide, nitrogen dioxide, and photochemical oxidants. Hydrocarbon classifications will be the same as for photochemical oxidants.

<sup>b</sup>µg/m<sup>3</sup> = micrograms per cubic meter; mg/m<sup>3</sup> = milligrams per cubic meter.

Air quality at the White Mesa Mill site area has a priority rating of IA, which signifies a violation of federal air standards for particulate matter and sulfur dioxide, both of which are attributable to emissions from fossil-fueled power plants located within the region. However, none of the power plants lie within 31 miles of the millsite, which suggests that the air quality in the vicinity of the site may be better than the priority IA classification indicates.

The State of Utah monitors total suspended particulates and sulfur dioxide at a station located 66 miles west of the millsite at Bull Frog Marina (Lake Powell). Except for the short-term (24-hour) particulate measurement, all reported values were well below the federal and State of Utah air quality standards. The 24-hour particulate violations are believed to have been caused by dust blown by high winds.

On the basis of data collected from sampling locations at the White Mesa Mill site for 1 year, dust-fall averaged 33 grams per square meter ( $\text{g/m}^2$ ) per month; the highest monthly average was  $102 \text{ g/m}^2$  occurring in August. Total suspended particulates monitoring from October 1977 through February 1978 produced a geometric mean of  $18 \mu\text{g/m}^3$ . This value is well below the federal and state air quality standard of  $50 \mu\text{g/m}^3$ . The maximum 24-hour concentration was  $79 \mu\text{g/m}^3$ , or approximately one-half of the federal and state standard of  $150 \mu\text{g/m}^3$ . Sulfation-rate monitoring at the White Mesa Mill site indicates that sulfur dioxide concentrations at the site are less than 0.005 parts per million (ppm). The federal and state standard for the annual average of sulfur dioxide is 0.03 ppm.

At the time of the 1978 environmental report (Dames and Moore 1978) and final environmental statement (NRC 1979), the Four Corners Air Quality Control Region had an air quality priority IA rating. This was an important consideration at the time because there was significant concern that windblown dust from coal storage stockpiles and air emissions (i.e., sulfur dioxides, particulate matter, carbon monoxide, and nitrogen oxides resulting from combustion of coal to power the mill) associated with operation of the mill would further degrade air quality in the region. However, the use of coal to fire boilers at the mill was discontinued in 1990. By 1994, propane was used to fire all process and heating boilers. The mill is no longer required to perform sulfation rate monitoring. NRC's final environmental statement concluded that operation of the White Mesa Mill would not have any significant impact upon regional air quality.

Currently, nonradioactive air emissions from the White Mesa Mill are regulated by the State of Utah in accordance with an air quality permit (1997 Approval Order DAQE-884-97). This permit establishes annual emission limits for the mill's yellowcake dryers and the vanadium circuit scrubber. Requirements for controlling dust from roads and fugitive sources are also included in this permit. The permit also specifies that the mill must comply with National Emissions Standards for Hazardous Air Pollutants for radon emissions (40 CFR 61). The air quality permit requires that particulate emissions ( $\text{PM}_{10}$ ) to the atmosphere shall not exceed 0.40 pound per hour for each yellowcake dryer and 2.50 pounds per hour for the vanadium circuit scrubber. Compliance testing of the scrubber and dryers must be performed within 180 days of the startup of a new emission point or the inclusion of an emission point in the permit and, thereafter, if and when directed by UDEQ. Monitoring for radionuclide emissions is conducted while the mill is operating.

To ensure compliance with applicable air quality standards and the requirements of the permit, restrictions are in place that control emissions from specific pieces of milling equipment and operations. These restrictions ensure compliance with emission levels specified in the permit by controlling ore processing rates and propane gas consumption rates. The mill is required to submit an annual emission inventory to UDEQ. [Table 3-39](#) summarizes the annual emission inventory for the key criteria emissions for the last 6 years. The key criteria emissions are  $\text{PM}_{10}$ , sulfur oxides, nitrogen oxides, volatile organic compounds, and carbon monoxide.

The NRC license also requires the mill to monitor total particulate matter. The mill's environmental air monitoring program uses four high-volume continuous air sampling stations; filters from each station are changed approximately every 7 days. Data collected from the air monitoring program are reported to NRC in semiannual effluent monitoring reports as required by 10 CFR 40.65.

Table 3–39. Air Emission Inventory for Key Criteria Emissions (tons per year)

Year	PM <sub>10</sub>	Sulfur Oxides	Nitrogen Oxides	Volatile Organic Compounds	Carbon Monoxide
1997	0.775	0.255	3.859	2.120	7.257
1998	-	-	-	-	-
1999	2.57	1.15	18.11	2.16	14.14
2000	1.9	1.47	14.61	2.76	11.78
2001	-	-	-	-	-
2002	0.68	0.98	9.04	1.80	11.49

Environmental air monitoring data collected to date indicate that concentrations of total suspended particulate matter resulting from mill emissions are in compliance with the applicable regulatory limit of 50 µg/m<sup>3</sup> and do not vary significantly from ambient concentrations of particulate matter measured at the mill. During a recent mill run (April–October 1999), average concentrations for particulate matter ranged from 20 to 40 µg/m<sup>3</sup>. By comparison, concentrations of particulate matter were measured at 26 to 44 µg/m<sup>3</sup> during a period in 2001 when operations were suspended at the mill.

#### **3.4.3.2 Visibility**

Southeastern Utah is known for its scenic vistas and attracts many visitors each year. Stack emissions (primarily steam) from the mill are visible to the public traveling US-191 east of the White Mesa Mill site. These emissions are not visible from the major recreational areas in the vicinity of the mill.

In its 1979 final environmental statement, NRC concluded that there would be no significant impacts to air quality as a result of the White Mesa Mill operations. NRC concluded that, although the operation of the mill would result in a slight increase in concentrations of particulate matter and ambient gaseous emissions, the concentrations would be below federal and state air quality standards, and they would not significantly degrade the regional air quality (NRC 1979).

Beginning with the 1994/1995 mill run, propane was used to fire all process and heating boilers. As a result, impacts to visibility resulting from windblown dust (from coal storage stockpiles) and from air emissions associated with the combustion of coal were significantly reduced.

### **3.4.4 Climate and Meteorology**

The climate of the site area in southeastern Utah is classified as semiarid continental. Data from the National Weather Service station in Blanding (approximately 5 miles north of the site) are considered representative of the site weather conditions. Weather data summarized by the Utah Climate Center for the town of Blanding are presented in the following discussion (Pope and Brough 1996).

Although varying somewhat with elevation and terrain, the climate in the White Mesa Mill area is also considered as semiarid, with normal annual precipitation of about 13.4 inches. Precipitation is characterized by wide variations in annual and seasonal rainfall punctuated by long periods of drought. Most precipitation is in the form of rain; the average annual snowfall of about 40 inches accounts for about 29 percent of the annual total precipitation. The region has

two separate rainfall seasons; one is in late summer to early autumn (July to October) and corresponds to the southwest monsoon season, and one is during the winter months of December to March. The mean annual relative humidity is about 44 percent and is normally highest in January and lowest in July.

The average annual Class A pan evaporation rate is 68 inches; the largest evaporation rate typically occurs in July (IUC 2003). Warm summers and cold winters typify the weather in the Blanding area. The mean annual temperature in Blanding is about 50 °F; the mean annual maximum is 63.6 °F, and the mean annual minimum is 36.4 °F. The coldest temperature recorded was –23 °F in February 1933 and the hottest temperature was 110 °F in June 1905. January is the coldest month, with an average low temperature of 16 °F and an average high temperature of 38 °F. July is the hottest month, with an average high temperature of 89 °F and an average low temperature of 57 °F.

Winds are usually light to moderate in the area during all seasons, although occasional stronger winds may occur in the late winter and spring. Winds are from the north and northeast approximately 30 percent of the time and from the south and southwest about 25 percent of the time. Winds are generally less than 15 mph; wind speeds faster than 25 mph occur less than 1 percent of the time.

### **3.4.5 Ground Water**

#### ***3.4.5.1 Hydrostratigraphy***

The White Mesa Mill site is underlain by unconsolidated alluvium and indurated sedimentary rocks of Cretaceous and Jurassic age consisting primarily of sandstone and shale. Ground water in the vicinity of the site occurs primarily as perched water in the Burro Canyon Formation of Cretaceous age, and under confined conditions in the Entrada and Navajo Sandstones of Jurassic age. The Entrada and Navajo Sandstones constitute the primary aquifer in the area of the White Mesa Mill site. The Entrada and Navajo Sandstones are separated from the Burro Canyon Formation by approximately 1,000 ft of unsaturated materials of the Morrison and Summerville Formations of Jurassic age that have a low average vertical permeability and form a significant aquitard.

#### ***3.4.5.2 Ground Water Occurrence***

Perched ground water beneath the site occurs primarily within the Burro Canyon Formation. The saturated thickness of the perched ground water zone generally increases to the north of the site. Perched ground water is supported within the Burro Canyon Formation by the underlying, fine-grained Brushy Basin Member of the Morrison Formation. The contact between these two units generally dips to the south-southwest beneath the site. The permeability of the Burro Canyon Formation is generally low; no significant joints or fractures are documented by cores from any wells or borings in the area. Any fractures in cores collected from site borings were typically cemented and had no open space. Some conglomeratic zones within the perched ground water system were observed east to northeast of the tailings cells at the site and may represent a relatively continuous zone of higher permeability. This zone is hydraulically cross gradient to upgradient of the tailings cells with respect to perched ground water flow. The higher permeability zone may extend beneath the southeastern margin of the cells but does not appear to exist downgradient (south-southwest) of the tailings cells based on current data.

Perched ground water was noted at depths of approximately 50 to 110 ft below land surface in the vicinity of the tailings cells at the site (IUC 2003). Information collected by the State of Utah Division of Radiation Control in September 2002 indicated that depth to ground water ranged from 17 to 110 ft and averaged 71 ft. The saturated thickness of the perched ground water zone ranges from approximately 82 ft in the northeast portion of the site to less than 5 ft in the southwest portion of the site (IUC 2003). Perched ground water flow at the site is generally to the south-southwest, and hydraulic gradients range from 0.04 ft/ft to less than 0.01 ft/ft downgradient of the tailings cells. The ground water gradient changes from generally southwesterly in the western portion of the site to generally southerly in the eastern portion of the site. In general, perched ground water levels have not changed significantly in most areas. An increase in water levels in the east and northeast portions of the site since 1994 are probably attributable to seepage from two wildlife ponds (IUC 2003). This activity may affect the ground water flow regime in the perched ground water system in this area.

Recharge to the perched ground water system is through percolation of rainfall and snowmelt through surface soils over the mesa top, along with infiltration of water from the wildlife ponds. Perched ground water at the millsite discharges where the Burro Canyon Formation crops out in springs and seeps along Westwater Creek Canyon and Cottonwood Canyon to the west-southwest of the site and along Corral Canyon to the east of the site. The primary discharge point for perched water flowing beneath the tailings cells is believed to be Ruin Spring in Cottonwood Canyon, approximately 2.5 miles south-southwest of the millsite. Ruin Spring is the only spring that flows consistently. The Ute Mountain Ute Tribe has indicated that it has performed extensive surveys of the seeps and springs on the perimeter of the geographic White Mesa, including tribal and BLM land, and that Ruin Springs is not the only consistently flowing spring on the mesa. DOE has requested these data from the tribe and will address the data once they are received.

The Entrada and Navajo Sandstones are prolific aquifers beneath and in the vicinity of the White Mesa Mill site. Because water wells at the site are screened through both of these units, they will be considered as a single aquifer. Ground water in the Entrada/Navajo aquifer is under artesian pressure, rising 800 to 900 ft above the top of the Entrada contact with the overlying Summerville Formation. Static ground water levels are 390 to 500 ft below ground surface. The site is located within a region that has a dry to arid continental climate and an average annual precipitation of 13.4 inches (IUC 2003). Recharge to regional aquifers occurs primarily along the mountain fronts (such as the Henry Mountains to the west and the Abajo Mountains to the north) and along the flanks of folds (such as Comb Ridge Monocline to the west).

### ***3.4.5.3 Ground Water Quality***

The quality of the Burro Canyon perched ground water beneath and downgradient from the site is poor and extremely variable. Concentrations of TDS measured in water sampled from upgradient and downgradient wells range between 1,200 and 5,000 mg/L (IUC 2003). Split sampling by the State of Utah Division of Radiation Control in September 2002 indicated a TDS concentration in perched ground water ranging from 608 to 5,390 mg/L. Approximately 55 percent of the wells sampled had a TDS concentration of less than 3,000 mg/L. Consequently, these wells appear to intercept drinking-water-quality ground water under the Utah Ground Water Quality Protection Regulations (Class II ground water) (UAC 2003a). Sulfate concentrations measured in samples from three upgradient wells varied between 670 and 1,740 mg/L. The spatial variability of the ground water quality makes the definition of

background water quality a challenge over the large extent of the millsite. This definition of background water quality is currently being refined.

Ground water monitoring for the past 20 years at the site has shown no impact to perched ground water from the tailings cells (IUC 2003). However, during the May 1999 sampling event, the presence of chloroform and other man-made volatile organic compounds was detected in samples from the perched aquifer beneath the White Mesa Mill site. Subsequent aquifer characterization by IUC indicated that the chloroform plume was approximately 1,700 ft long and located across the eastern margin of the IUC facility. According to IUC, the chloroform was used in the laboratory of an earlier ore-buying station that operated at the site. The chloroform used for that operation was disposed of through a leach field. However, IUC has not yet completed its ground water contaminant investigation report required by an August 23, 1999, UDEQ ground water corrective action order. Therefore, it is not yet known how many sources of chloroform actually contributed to the contaminant plume along the eastern margin of the site.

Water quality from Ruin Spring (discharge from the perched ground water system), approximately 2.5 miles south-southwest of the mill, is generally good; TDS concentration is less than 1,000 mg/L (IUC 2003).

Ground water quality in the Entrada/Navajo aquifer is good; TDS content ranges from 216 to 1,110 mg/L (IUC 2003). Sampling of ground water in the Entrada/Navajo aquifer is not required under the mill's monitoring program because the aquifer is isolated from the perched ground water zone by approximately 1,000 ft of rock formations that have a low average vertical permeability.

UDEQ has identified potential elevated uranium concentrations in the shallow alluvial aquifer that exceed state ground water quality standards. If UDEQ determined that ground water corrective action or remediation was required, DOE would consult with UDEQ to determine the most feasible location for the "dry cell".

#### ***3.4.5.4 Ground Water Use***

Because of the generally low permeability of the perched ground water zone beneath the site, well yields are typically low (less than 0.5 gpm), although yields of about 2 gpm or greater may be possible in wells intercepting the higher permeability zones on the east side of the site (IUC 2003). Sufficient productivity can, in general, only be obtained in areas where the saturated thickness is greater, which is the primary reason that the perched ground water zone has been used on a limited basis as a water supply to the north (upgradient) of the site. The perched ground water is used primarily for stock watering and irrigation.

The Entrada/Navajo aquifer is capable of yielding domestic quality water at rates of 150 to 225 gpm and is used as a secondary source of potable water for the White Mesa Mill. Five deep water supply wells constructed by IUC at the White Mesa Mill facility (WW-1 through WW-5) are used for industrial and domestic needs. These wells are completed in the Entrada/Navajo aquifer. Also, two domestic water supply wells located 4.5 miles southeast of the millsite on the Ute Mountain Ute Indian Reservation draw water from this aquifer. Although the water quality and productivity of the Entrada/Navajo aquifer are generally good, the depth of the aquifer (approximately 1,200 ft below land surface) makes access difficult.

### 3.4.6 Surface Water

#### 3.4.6.1 Surface Water Resources

No perennial surface water is present on the White Mesa Mill site. This lack of surface water results from the gentle slope of the mesa on which the site is located, the low average annual rainfall of 13.4 inches (measured at Blanding), local soil characteristics, and the porous bed material of local stream channels. The millsite is drained almost equally by Corral Creek on the east and by Westwater Creek and Cottonwood Wash on the west. White Mesa is defined by these two adjacent main drainages that have cut deeply into the regional sandstone formations. Storm water runoff in the local ephemeral streams is characterized by a rapid rise in flow rates followed by rapid recession, primarily because of the small storage capacity of the surface soils in the area. Monthly water flow is monitored on the larger drainage features (Cottonwood Wash, Recapture Creek, and Spring Creek); however, the smaller water courses closest to the millsite are not monitored because of their infrequent flows. Water flows through these drainages primarily during local heavy rainfall (occurring mostly during the months of August through October) and snowmelt (occurring mostly in April). Flow typically ceases in Corral and Westwater Creeks within 6 to 48 hours following significant storm events.

The U.S. Geological Survey (USGS) maintains two stream gages on watercourses in the region. One gaging station (No. 09378630) is located on Recapture Creek in the upper portion of the watershed at an elevation of 7,200 ft above mean sea level; the second gaging station (No. 098378700) is located on Cottonwood Wash approximately 7 miles southwest of Blanding at an elevation of 5,138 ft. Corral Creek has a drainage area of approximately 5.8 square miles adjacent to the site and is a tributary of Recapture Creek. Westwater Creek on the western edge of the site has a drainage area of nearly 27 square miles and is a tributary of Cottonwood Wash. Both Cottonwood Wash and Recapture Creek flow in a southerly direction and are tributaries of the major drainage artery of the region, the San Juan River. The San Juan River is a major tributary of the Colorado River and drains approximately 23,000 square miles above Bluff, Utah, which is located at the mouth of Cottonwood Wash. The San Juan River flows in a westerly direction toward its confluence with the Colorado River at Lake Powell, which is about 114 river miles west of Bluff. The major drainages in the vicinity of the White Mesa Mill site are summarized in [Table 3–40](#). Total runoff from the site is estimated to be less than 0.5 inch annually.

*Table 3–40. Drainage Basins Near the White Mesa Mill Site*

<b>Basin Description</b>	<b>Drainage Area (square miles)</b>
Corral Creek at confluence with Recapture Creek	5.8
Westwater Creek at confluence with Cottonwood Wash	26.6
Cottonwood Wash at USGS gage west of millsite	<205
Cottonwood Wash at confluence with San Juan River	<332
Recapture Creek at USGS gage station	3.8
Recapture Creek at confluence with San Juan River	<200
San Juan River at USGS gage downstream at Bluff, Utah	<23,000

Source: *Description of the Affected Environment, White Mesa Mill, Blanding, Utah, for Transport by Slurry Pipeline and Disposal of the Moab Tailings* (IUC 2003)

Two small, ephemeral catch basins are located near the millsite; these ponds are filled by the mill to provide water and habitat for local wildlife. Springs and seeps at the edge of White Mesa are fed by the perched aquifer system and support wildlife and livestock in the area. These springs and seeps may constitute future points of exposure for mill tailings contaminants.

#### ***3.4.6.2 Surface Water Quality***

Sampling of surface water quality in the mill vicinity began in July 1977 and continued through March 1978. Baseline data show conditions existing at the millsite and vicinity at that time. No samples were collected from the two catch basins at that time because they were dry. Sampling of ephemeral surface waters in the vicinity was possible only during major precipitation events; these streams are normally dry at other times.

Previous investigations (IUC 2003) concluded that surface water quality in the vicinity of the millsite is generally poor. Water samples collected from Westwater Creek were characterized as having high TDS (averaging 674 mg/L) and sulfate (averaging 117 mg/L). The waters were typically hard (total hardness measured as calcium carbonate averaged 223 mg/L) and had an average pH of 8.25; however, according to Utah ground-water classification and water-quality standards, TDS concentrations for a drinking water class II aquifer range from 500 to 3,000 mg/L. Estimated water velocities for Westwater Creek averaged 0.3 ft per second at the time of sampling. Samples from Cottonwood Creek were similar in quality to those from Westwater Creek, although TDS and sulfate levels were lower (TDS averaged 264 mg/L; sulfate averaged 40 mg/L) during heavy spring flow conditions (80 ft per second water velocity). During heavy runoff, the concentration of TDS in these streams increased to more than 1,500 mg/L. Concentrations of mercury and iron above background were measured in some samples. These values appear to reflect surface water quality in the area and are probably because of evaporative concentration and not because of human disturbance of the environment (NRC 1979).

In 1997, NRC prepared an environmental assessment (NRC 1997) to address renewal of the White Mesa Mill source material license (No. SUA-1358). NRC specified that surface water monitoring would be conducted at two sampling locations, Westwater Creek and Cottonwood Creek, adjacent to the mill. Grab samples were collected annually from Westwater Creek and quarterly from Cottonwood Creek.

These surface water samples were analyzed for TDS, total suspended solids, gross alpha, and total and dissolved concentrations of natural uranium, thorium-230, and radium-226. Field measurements included pH, specific conductivity, and temperature. Since the mill began operations in 1980, the measured values for these constituents have been consistently low.

[Table 3–41](#) summarizes the results from monitoring conducted at Cottonwood Creek and Westwater Creek. In 2000 and 2002, Westwater Creek was dry, so no data are available for those years. Data from the mill's monitoring program indicate that concentrations of all analytes in samples collected from the Cottonwood and Westwater Creeks are within the range of background (NRC 1979).

### **3.4.6.3 Relevant Water Quality Standards**

All ephemeral water bodies near the White Mesa Mill site area are tributaries of the San Juan River, which flows into the Colorado River; therefore, they are subject to the water quality classifications specified in Utah Administrative Code R317-2-13 (see Chapter 7.0).

### **3.4.7 Floodplains**

Several streams exist near the White Mesa Mill site, but the site lies outside any potential floodplains. A more detailed description of these streams is available in Appendix F.

### **3.4.8 Wetlands**

Topographic maps of the region potentially indicate 10 areas with riparian or wetland potential within the site boundary. Water resources in and near the White Mesa Mill site have not been assessed in detail, but several resources are known to exist. Appendix F includes more detailed descriptions and the locations of these known resources.

### **3.4.9 Terrestrial Ecology**

This section describes the vegetation and wildlife, including protected and sensitive species, for the White Mesa Mill site. The region north of the millsite has the greatest diversity of vegetation compared to the other alternative sites. This diversity is primarily because of variation in life zones, elevations, and precipitation between the Moab site and the White Mesa Mill. However, sparsely vegetated desert-shrub communities dominate the immediate millsite area.

#### **3.4.9.1 Terrestrial Vegetation and Wildlife**

At the White Mesa Mill site, several areas were chained (i.e., trees and vegetation were removed) to support an active cattle ranch prior to mill operations. These areas were reseeded but are now mostly void of vegetation because of overgrazing, which has resulted in limited habitat. Current vegetation consists primarily of crested wheatgrass and invasive weeds. Surrounding areas of abandoned dry farms are dominated by annual weeds, rabbitbrush, snakeweed, sagebrush, and cheatgrass. Areas that were neither cultivated nor chained support sagebrush communities with a sparse understory of grasses, including galleta and crested wheatgrass. The potential vegetation consists of more than 50 percent palatable grasses such as western wheatgrass, Indian ricegrass, needle-and-thread, and squirreltail; 15 to 20 percent increaser grasses, including galleta and blue grama; 25 percent decreaser browse plants, including winterfat; and 5 to 10 percent big sagebrush, ephedra, and other shrubs. Forbs are rare.

On a visit to the site on January 29, 2003, the north and south sides of the entrance road to the White Mesa Mill were surveyed, and plant composition was documented. Three different areas similar to those described by the U.S. Department of Agriculture (USDA 1993) were observed. One area, northeast of the entrance road, is dominated by basin big sagebrush, which accounts for approximately 30 percent of the relative cover. The understory consists of galleta (20 to 30 percent), Indian ricegrass (5 percent), and cheatgrass (10 percent). Rubber rabbitbrush is growing along the disturbed soil next to the road. The area south of the entrance road is dominated by Wyoming big sagebrush (50 percent relative cover), and galleta and cheatgrass each account for approximately 10 percent of the relative cover. The northwest area of the entrance road has been previously seeded with crested wheatgrass (20 percent relative cover);

rubber rabbitbrush (30 percent) is the dominant shrub. Other grasses include galleta (5 percent) and cheatgrass (5 percent). Table 3–42 shows the vegetation characteristics of the site, and Table 3–43 presents detailed vegetative structure at the site.

The millsite is somewhat comparable to the Moab site in terms of wildlife diversity and abundance. Pronghorn antelope, mule deer, and bobcat may occur in the vicinity of the site, depending upon habitat type. The red fox, gray fox, badger, longtail weasel, desert cottontail, and black jackrabbit are known to occur on the site.

Table 3–42. Vegetation Characteristics on the Various Soil Types at the White Mesa Site

Soil Name	Range Site	Characteristic Potential Vegetation	Percent	Productivity (pounds/acre)	Rooting Depth (inches)
Blanding very fine sandy loam, 2 to 10 percent slopes	Semidesert loam	Wyoming big sagebrush ( <i>Artemisia tridentata</i> ssp. <i>wyomingensis</i> )	20	400–800	>60
		Indian ricegrass ( <i>Achnatherum hymenoides</i> )	15		
		Galleta ( <i>Pleuraphis jamesii</i> )	10		
		Bottlebrush squirreltail ( <i>Elymus elymoides</i> )	10		
		Winterfat ( <i>Ceratoides arborescens</i> )	10		
		Globemallow ( <i>Sphaeralcea</i> spp.)	5		
		Needle-and-thread ( <i>Hesperostipa comata</i> )	5		
		Douglas rabbitbrush ( <i>Chrysothamnus viscidiflorus</i> )	5		

Notes: USDA (1993), Mellenthin soil type not found.  
Source: NRCS 2002; SCS 1989.

Table 3–43. Community Structure Parameters of the White Mesa Mill Site Plant Communities

Community Group/Species	Relative Density	Percent Cover	Relative Cover	Relative Frequency
<b>Reseeded Grassland I</b>				
Grasses and grasslike plants				
Crested wheatgrass ( <i>Agropyron cristatum</i> )	92.0	12.0	78.2	66.4
Sixweeks fescue ( <i>Vulpia octoflora</i> )	1.0	0.1	0.5	5.6
Galleta ( <i>Pleuraphis jamesii</i> )	2.0	0.3	2.4	2.4
Squirreltail ( <i>Elymus elymoides</i> )	1.0	0.1	0.5	2.4
Forbs				
Chicory ( <i>Cichorium intybus</i> )	0.3	0.2	1.2	2.4
Scarlet globemallow ( <i>Sphaeralcea coccinea</i> )	0.3	0.1	0.5	2.4
Shrubs				
Broom snakeweed ( <i>Gutierrezia sarothrae</i> )	4.0	1.9	13.3	16.0
Pale desert-thorn ( <i>Lycium pallidum</i> )	0.3	0.5	3.6	2.4
Total vegetative cover		15.2		
Bare Ground		61.0		
Litter		24.2		
<b>Reseeded Grassland II</b>				
Grasses and grasslike plants				
Crested wheatgrass ( <i>Agropyron cristatum</i> )	96.0	8.9	82.7	75.0
Forbs				
Russian thistle ( <i>Salsola kali</i> )	0.6	0.1	1.2	5.0
Scarlet globemallow ( <i>Sphaeralcea coccinea</i> )	3.0	1.4	13.0	15.0

Seven species of amphibians are thought to occur in the area, but none are believed to inhabit the site. Up to 11 species of reptiles are believed to be in the vicinity of the millsite. No critical habitat exists in the millsite area.

### **3.4.9.2 Threatened and Endangered Species**

This section describes federally listed terrestrial threatened and endangered, proposed, or candidate species that are or may be present in the White Mesa Mill site area. In March 2003, DOE requested an updated list of such species from USF&WS that may be present or affected by DOE's proposed alternatives. USF&WS responded in April 2003 with a list for San Juan County. Table 3–44 lists a subset of those species that may occur in the vicinity of the White Mesa Mill site.

*Table 3–44. Federally Listed Threatened or Endangered Species Potentially Occurring in the Vicinity of the White Mesa Mill Site*

Common Name	Scientific Name	Habitat Present and Affected	Species Present	Status	Comments
Navajo sedge	<i>Carex specuicola</i>	Possible	Possible	Threatened	
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Possible	Possible	Endangered	
Black-footed ferret	<i>Mustela nigripes</i>	No	No	Endangered	
Bald eagle	<i>Haliaeetus leucocephalus</i>	Possible	Possible	Threatened	Proposed for Delisting
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Possible	Possible	Threatened	
Gunnison sage grouse	<i>Centrocercus minimus</i>	Possible	Possible	Candidate	

Spatial data for the species listed in Table 3–44 were obtained from the Utah Conservation Data Center (UCDC). This data set was compiled by the Utah Natural Heritage Program (UNHP) of UDWR, in which species occurrences are depicted as points at a scale of 1:24,000 on 7.5-minute topographic quad maps. Spatial data depicting the White Mesa Mill site were overlaid on the species of concern spatial data to evaluate known species occurrences in the area.

The status of each of these species in the vicinity of the White Mesa Mill site is briefly discussed below. Appendix A1, “Biological Assessment,” provides more detailed information concerning these federally listed species that may be in the vicinity of the White Mesa Mill site or could be affected by activities at the site.

All of the known populations of Navajo sedge in Utah are located at least 20 miles southwest of the White Mesa Mill site and associated borrow areas (UDWR 2003b). The Navajo sedge also is unlikely to occur at the White Mesa Mill site because the species requires wetland areas that do not occur within the area to be disturbed by development of the disposal cell.

There was a reported southwestern willow flycatcher sighting in San Juan County in the vicinity of the slurry pipeline corridor (UDWR 2003b). However, there is no information on the date of the reported sighting or on whether the sighting was confirmed. There is no suitable habitat for flycatchers known to occur on the White Mesa Mill site because wetland areas do not occur within the area to be disturbed by development of the disposal cell.

UDWR (2003b) reported a confirmed ferret sighting in the vicinity of the White Mesa Mill site in 1937. However, all black-footed ferrets currently in the wild are believed to be the result of a

federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the White Mesa Mill site. Black-footed ferrets depend almost exclusively on prairie dog colonies for food, shelter, and denning. Although the area from Moab south along US-191 toward the White Mesa Mill site supports colonies of Gunnison's prairie dog (*Cynomys gunnisoni*) (Seglund 2004), no colonies are currently known to occur at or close to the White Mesa Mill site.

The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas, and they are known to frequent the area between Monticello and Blanding. However, bald eagles are not known to nest or night roost nor is it known to have been observed in the vicinity of the White Mesa Mill site.

Designated critical habitat for the Mexican spotted owl occurs within 2 miles of the transportation corridor just south (within 25 miles) of the Moab site. However, the southern tip of this section of critical habitat that lies within 2 miles of the transportation corridor is located at least 50 miles from the White Mesa Mill site. Further, data provided by UDWR (2003a) indicated that there were no occurrences of the Mexican spotted owl in any of the project areas. Thus, it is unlikely that spotted owls occur in the vicinity of the White Mesa Mill site.

Although the White Mesa Mill site is within a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000), this species is not known to occur at the White Mesa Mill site (IUC 2003).

There is no designated or proposed critical habitat for any of the above federally protected species in the vicinity of the White Mesa Mill site.

On the White Mesa Mill site, there is no recorded presence of any threatened and endangered species (IUC 2003), including amphibians or reptiles (Dames and Moore 1978; UDWR 2003b).

#### ***3.4.9.3 Other Special Status Species***

As previously discussed, special status species are those that are protected under federal and state regulations other than the ESA, which include the MBTA, Executive Order 13186, and Birds of Conservation Concern (USF&WS 2002f). The State of Utah and federal land management agencies maintain a list of species that they consider threatened, endangered, or sensitive or otherwise of concern. UDWR identified several species of state concern (UDWR 2003b), which included BLM- and USFS-identified species. However, only those listed by the USF&WS under the ESA are included in Section 7 consultations or in the Biological Assessment. Although the special status species are not covered by the ESA, USF&WS encourages protection of these species.

Table 3–45 lists plant species considered by state and federal resource agencies to be endangered, threatened, or otherwise of concern that may occur in the site region. A number of the species listed by the State of Utah or considered sensitive by BLM are potentially present in the vicinity of the White Mesa Mill site.

Table 3–46 includes animal species listed by the State of Utah as endangered, threatened, or otherwise of concern that may be present in the project region. The list includes all species identified by UDWR as potentially occurring in San Juan County; in some cases, the known population locations or suitable habitats may not be close to the site. The species listed as endangered or threatened by UDWR are discussed below.

Raptors are of primary concern, including the burrowing owl, golden eagle, red-tailed hawk, and osprey. The Raptor Protection Act requires that surveys be conducted before disturbances, depending upon season and proximity to nesting areas. Other birds of concern in the area include the long-billed curlew, loggerhead shrike, gray vireo, virginia's warbler, cassin's sparrow, and brewer's sparrow. Species previously described are not discussed in this section.

The long-billed curlew, although typically associated with aquatic environments, is also found in a variety of habitats, including plains, prairies, and open rangeland. In discussions with the BLM Monticello office, it was discovered that this species is commonly found in habitats frequented by burrowing owls in the vicinity of the White Mesa Mill site. The loggerhead shrike is typically found in open country, low scrub, and desert environments characteristic of the northern and southernmost segments of the transportation corridor. The gray vireo and virginia's warbler are commonly found in the foothills zone characterized by piñon-juniper forest, scrub oak, and open chaparral. The cassin's and brewer's sparrows are found in habitat characterized by low brush (e.g., sagebrush) and arid to semiarid regions.

[Table 3–47](#) lists bird species, including migratory birds, that may occur in the vicinity of the site, although on-site habitat limits typical nesting and breeding activities. Most of these species are protected under the MBTA, which prohibits take or destruction of birds, nests, or eggs of listed migratory birds.

### **3.4.10 Land Use**

Of the more than 4.9 million acres in San Juan County, approximately 60 percent of the land is administered by federal agencies. There are several national parks in the county. The entire western boundary of the county is adjacent to Canyonlands National Park, Glen Canyon National Recreation Area, the Colorado and Green Rivers, and Lake Powell. Approximately 28 miles due west of the White Mesa Mill site is Natural Bridges National Monument. Hovenweep National Monument is about 25 miles to the east-southeast. San Juan County has a total of 15 national, state, and tribal parks and recreation areas. Most of these resources are within a 50-mile radius of the site, but none are in the immediate vicinity of the site.

Approximately 30 percent of San Juan County lands are in Indian reservations. The White Mesa Ute Indian Reservation totals more than 8,300 acres and is located 3.4 miles south of the site along both sides of US-191. Several small, isolated, and uninhabited Ute Reservation parcels are west of Blanding. The Navajo Reservation occupies the entire southern portion of the county and constitutes 28 percent of county lands.

Much of the land in San Juan County is public domain and open to recreational use. Tourism is increasingly becoming the mainstay of the local economy. Favorable weather allows off-road access for hikers, bikers, and off-highway vehicles in virtually all seasons. The Colorado River, which runs along the western border of the county, is a source of extensive recreational use for summer water sports. BLM administers most of the federal lands and makes the lands available for grazing, oil and gas leasing, and mining claims. As late as 1977, San Juan County was the largest processor of uranium ore in Utah. The Aneth Oil Field in southern Utah is the second largest field in Utah and is still producing. While oil production has been steadily declining, natural gas production is expanding. The USFS lands are also available for multiple uses such as recreational, agricultural, and timber and mining production.



low rainfall and lack of sufficient vegetation limit livestock numbers. Except where irrigation is present, livestock herds are widely spaced, and federal grazing allotments cover large areas.

In the past, dry farming has been largely unsuccessful on soil types characteristic of this area. However, the Blanding soils are deep and easy to plow, have high moisture-holding capacity, and are high in inherent fertility if irrigated.

The White Mesa Mill site is a 5,415-acre parcel that is privately owned by IUC. Land use in the vicinity of the site and directly outside the property boundary is zoned agricultural by San Juan County. Land within 5 miles of the site is privately owned agricultural land. A parcel of land comprising the site is a six-section area that is zoned as an industrial controlled district. Blanding is expanding its commercial district to the south along US-191 in the direction of the site. It is currently 4.7 miles from the northern edge of the site to the southern expansion of Blanding development. A National Guard Armory is 3.7 miles north of the site.

The largest communities in San Juan County are Monticello and Blanding. Very few residents live near the site. The nearest full-time residence is a farm/ranch located 1.6 miles north of the site. A residence associated with a convenience store and gas station is located at the intersection of US-191 and SR-95 approximately 3 miles north of the site. In addition, there is a residence at the Blanding airport about 3.5 miles north of the site. The Ute Mountain Reservation is 3.4 miles south of the site, and the community of White Mesa is approximately 5 miles to the south.

[Figure 3–38](#) presents a land use map of the White Mesa Mill site area.

Ongoing consultations with White Mesa Mill elders have identified burial sites near the White Mesa Mill site entrance.

### **3.4.11 Cultural Resources**

The cultural history of the White Mesa Mill site area is discussed in the more general cultural history of southeastern Utah described in Section 3.1.13.1; the Class I cultural resource inventory that was conducted for the White Mesa Mill site is described in Section 3.1.13.2.

Results of the Class I inventory (Davis et al. 2003) indicate that a number of Class III cultural resource surveys have been conducted at the White Mesa Mill site, primarily between 1976 and 1981. The areas of the White Mesa Mill site encompassed by the Class I inventory include Sections 28, 29, 32, and 33 of T. 37 S., R. 22 E. and Sections 4 and 5 and the north half of Section 9 of T. 38 S., R. 22 E. Within this area, the Class I inventory documented 231 cultural sites. Of these 231 sites, 196 (85 percent) have been determined eligible for inclusion in the National Register of Historic Places. [Table 3–48](#) summarizes the types of sites documented for each section.

The probable time periods represented by the 231 sites are summarized, by section, in [Table 3–49](#). Most of the sites are associated with Anasazi habitation between A.D. 450 and A.D. 1150. From an initial low frequency of Archaic and Basketmaker II sites (see Table 3–49 footnotes), there is a pronounced increase in Basketmaker III sites, followed by a steady increase in sites through the Pueblo I and Pueblo II periods. The population of prehistoric inhabitants appears to have peaked during early Pueblo II and remained fairly stable into the early Pueblo III period, after which it declined sharply. In contrast to the high number of prehistoric sites, only seven sites are attributed to the historic period. Of this total, one is a Navajo camp and one is a Ute camp; the other five lacked diagnostic artifacts or other attributes to determine cultural affiliation.

*Table 3–48. White Mesa Mill Site—Summary of Cultural Sites by Type*

Section	Habitation Site	Temporary Habitation Site	Limited Activity Site	Granary	Quarry	Unknown	Total	NRHP Eligible Yes/No
Sec. 28	17		11				28	21/7
Sec. 29	7	2	3	6		2	20	18/2
Sec. 32	15	2	12		2	7	38	31/7
Sec. 33	22		13			1	36	21/15
Sec. 4	38		5				43	43/0
Sec. 5	32	4	11				47	45/2
Sec. 9, N1/2	12	2	5				19	17/2
Total	143 (62%)	10 (4%)	60 (26%)	6 (3%)	2 (1%)	10 (4%)	231	196/35 (85%/15%)

NRHP = National Register of Historic Places

Within the 6.5-section area encompassed by the Class I inventory, a notable site distribution pattern—from northeast to southwest—is present. The more northerly Sections 28 and 29 average 24 sites per square mile; the middle Sections 32 and 33 average 37 sites per square mile; and the southerly Sections 4 and 5 average 45 sites per square mile. This increasing site density from northeast to southwest is likely a function of specific environmental factors—mainly, nearness to a water source. The more southerly sites are closer to the canyon edges where the water sources are located.

Recent interviews (Fritz 2004) with tribal members indicate that at least five potential traditional cultural properties associated with the White Mesa Ute Tribe exist on or near the White Mesa Mill site. These are “potential” traditional cultural properties because their eligibility for National Register status has yet to be determined; this determination would be made during the Section 106 consultation process. Interviews conducted with tribal members before the current mill was constructed indicate that sacred areas existed within the IUC site boundaries at that time as well (Fritz 2004). In the White Mesa Mill area, the likelihood of occurrence of traditional cultural properties and their estimated density are extremely high (on a scale of low-medium-high-extremely high) and are likely associated with the Ute Tribe, Navajo Nation, and Hopi Tribe (Fritz 2004). Traditional cultural properties in this area may include sacred gathering areas, sacred healing areas, sacred springs, and burial areas.

### **3.4.12 Noise and Vibration**

The White Mesa Mill site is within the boundaries of the IUC site. Background noise levels are expected to be comparable to noise levels associated with open desert areas, with some influence from the existing IUC operation. These noise levels could approach 50 to 60 dBA at the White Mesa Mill site area as a result of operations at the IUC mill. US-191 passes about 1 mile to the east of the White Mesa Mill site area and does not significantly contribute to background noise (less than 50 dBA).

Neither background noise nor ground vibration data are available for the White Mesa Mill site. No residences are in the surrounding areas, although the land adjacent to IUC property may be used for outdoor recreation.

### **3.4.13 Visual Resources**

The White Mesa Mill site is located immediately west of US-191 in a rural area approximately 5 miles south of the town of Blanding and 5 miles north of the community of White Mesa. Gently rolling rangelands dotted with sagebrush, piñon-pine, and juniper surround this commercial facility. Most of the facility consists of several large metal structures, a yellow-brick office building, and numerous earthen piles. The taller structures and piles are visible from US-191 but do not dominate the view because of their distance (approximately 0.5 mile) from the highway. The existing disposal cells are not visible from the highway (Figure 3–39).



*Figure 3–39. View of the White Mesa Mill Site from the Entrance Road on US-191*

Approximately 1.6 miles north of the facility is the nearest residence, from which the taller facility structures are barely visible. The areas proposed to be disturbed by the new disposal cells are not visible from US-191 or from the nearest residence. BLM places the area surrounding the facility in the Class III visual resources category (Sweeten 2003). Section 3.1.15 describes the visual resource classes.

### **3.4.14 Infrastructure**

#### ***3.4.14.1 Waste Management***

Mill-generated sewage is disposed of in an on-site state-approved leach field system. This system manages sanitary wastes generated by the 70 to 100 full-time workers that are typically employed when the mill is in production mode; the maximum capacity of the system is unknown. Mill-generated solid waste is disposed of in the on-site tailings cells.

#### ***3.4.14.2 Electric Power Supplies***

An existing three-phase overhead power line runs adjacent to US-191; an existing substation that supplies the White Mesa Mill site is approximately 0.25 mile from the site. The existing power line ends approximately 4 miles north of where the booster pump station would be located.

#### ***3.4.14.3 Water Supplies***

Potable and nonpotable water needs at the White Mesa Mill site are supplied from existing deep wells and the Recapture Reservoir, respectively. The Entrada/Navajo aquifer is capable of yielding domestic quality water at rates of 150 to 225 gpm (216,000 to 324,000 gallons per day) and is used as a secondary source of potable water for the White Mesa Mill site. There are five deep water supply wells constructed by IUC at the White Mesa facility.

### **3.4.15 Transportation**

Table 3–15 in Section 3.1.17 describes AADT, congestion, truck percent, and accident rates on US-191 between Moab and Blanding. US-191 south of Moab is generally not congested; it carries AADT volumes that vary from 2,861 at the junction of US-191 and the White Mesa Mill site to 7,450 at the south Blanding city limits. At the San Juan County/Grand County line, traffic increases to an AADT of 8,510. The road is two-lane until it reaches downtown Moab. Two road segments are noted as having actual accident rates that exceed the expected accident rate; other reported segments are considered not congested and have low accident rates. The two segments that have high accident rates occur at the junction of US-191 and US-491 (formerly US-666) in Monticello, and at the junction of US-191 and SR-95 south of Blanding (see [Figure 3–40](#)).

Although road congestion and accident rates are considered low, south of Moab, US-191 follows rolling hills with often poor sight lines around curves.

No rail transportation is available between the Moab site and the White Mesa Mill site.

### **3.4.16 Socioeconomics**

#### ***3.4.16.1 Demography of the Area***

The 2000 census reported the population density of San Juan County as 1.8 individuals per square mile. By comparison, the statewide density is greater than 27.2 persons per square mile.

Blanding, approximately 5 miles north of the mill, is the largest population center near the millsite and had a 2000 census population of 3,162. Approximately 5 miles southeast of the White Mesa Mill site is the White Mesa community of approximately 277 Ute Mountain Ute tribal members. An estimated 60 to 75 individuals live within 5 miles of the site (IUC 2003) ([Figure 3–41](#)). The nearest resident to the millsite is approximately 1.6 miles north of the mill.

The Navajo Reservation is approximately 19 miles southeast of the mill. The nearest community on the Navajo Reservation is Montezuma Creek, with a population of about 507. Figure 3–41 provides population centers located within 50 miles of the millsite.

### **3.4.16.2 Socioeconomic Profiles**

San Juan County is the largest and poorest county in Utah. As of October 2002, the unemployment rate in the county was 7.8 percent, compared to 5.2 percent in the state of Utah, and 5.6 percent for the nation. When operating, the White Mesa Mill is the largest private employer in San Juan County, employing 70 to 100 full-time workers. Typically, the mill employs a high percentage of minority workers. During the mill operation that began in June 2002, mill employment ranged from 45 to 75 percent Native Americans.

Since its inception in 1980, the mill has run on a campaign basis, in each case remaining on standby pending accumulation of sufficient ore stockpiles to justify a milling campaign. Currently, mill employees are predominantly residents of San Juan County or residents of neighboring counties who commute to the mill daily. Historically, the mill has drawn from residents of San Juan County and neighboring counties for each milling campaign, rather than relying upon an influx of workers to the area.

### **3.4.17 Human Health**

Nationwide, on average, people are exposed to approximately 300 mrem/yr from natural background radiation (NCRP 1987). [Table 3–50](#) summarizes the radiation doses from natural background, assuming residential exposure is occurring at the White Mesa Mill site.

*Table 3–50. United States and the White Mesa Mill Site Natural Background Radiation Doses*

Source	U.S. Average Natural Background Radiation Dose (millirem/yr)	White Mesa Mill Natural Background Radiation Dose (millirem/yr)
Cosmic and cosmogenic radioactivity	28	68
Terrestrial radioactivity	28	74
Internal radioactivity	40	40
Inhaled radioactivity	200	260
Rounded Total	300	440

The largest natural source is inhaled radioactivity, mostly from radon-222 and its radioactive decay products in homes and buildings, which accounts for about 200 mrem/yr. Additional natural sources include radioactive material in the earth (primarily external radiation from the uranium and thorium decay series), radioactive material in the body (primarily potassium-40), and cosmic rays from space filtered by the atmosphere.

The actual radiation dose from natural background radiation varies with location. On the basis of data for Blanding, the radiation dose from cosmic and cosmogenic radioactivity would be about 69 mrem/yr at the White Mesa Mill site, the radiation dose from external terrestrial radioactivity would be about 74 mrem/yr, and the radiation dose from radon-222 and its radioactive decay products would be about 260 mrem/yr (IUC 2003). The total natural background radiation dose at the White Mesa Mill site would be about 440 mrem/yr, considerably higher than the national average.

According to the 2000 census, the population within 50 miles of the White Mesa Mill site was about 21,800 (Figure 3–41). Assuming that all residents were exposed to 440 mrem/yr, the population dose would be about 9,600 person-rem per year.

#### Existing Operations at the White Mesa Mill

The individual radiation dose for members of the public from existing operations at the White Mesa Mill was estimated to be 10 mrem per year (IUC 2003). The population dose to the 50-mile population surrounding the White Mesa Mill site was estimated to be 4 person-rem per year (IUC 2003).

For workers at the White Mesa Mill, the average individual radiation dose was 0.11 rem in 1999. The population dose to these workers was 10 person-rem.

### **3.4.18 Environmental Justice**

Section 3.1.20 describes the legal basis for evaluating environmental justice and general census characteristics in San Juan County. Figure 3–42 and Figure 3–43 provide the minority population distribution within 50 miles of the site and income by household, respectively. The Navajo Reservation occupies a significant portion (28 percent) of San Juan County. Figure 3–42 shows greater than 50 percent of the total population as minority occurring within 20 miles of the White Mesa Mill site. The Ute Mountain Reservation is adjacent to the White Mesa Mill site. Reported household incomes of less than \$18,244 per year (poverty level for a family of four) are found in census group blocks within about one-half of the minority-populated areas south of the site.

The closest low-income block group is about 15 miles from the site. Areas west of US-191 that are considered to have greater than 50 percent minority population had reported incomes between \$18,244 and \$41,994.

### **3.4.19 Pipeline Corridor**

#### ***3.4.19.1 Geology***

This section describes the level of seismic risk, possibility for subsidence, landslide potential, and occurrence of expansive clay evaluated from a geologic perspective for the proposed pipeline route from the Moab site to the White Mesa Mill site.

Seismicity (and seismic risk) is low in this part of the central Paradox Basin, and has a low rate of occurrence with small- to moderate-magnitude earthquakes (Wong and Humphrey 1989). The pipeline route is in Uniform Building Code 1, indicating lowest potential for earthquake damage (Olig 1991).

Quaternary displacement is evident along the Shay Graben Faults (Wong and Humphrey 1989), and small earthquakes have possibly been associated with these faults (Wong et al. 1996), the eastern ends of which cross the pipeline route about 3 miles south of Church Rock. The similar east-striking Verdure Graben Fault system may also have had Quaternary displacement; the proposed pipeline corridor would cross this fault system about 5 to 6 miles south of Monticello.

Geologic conditions for subsidence and landslides were evaluated in the EIS for the Queston, Williams, and Kern River pipeline route (DOI 2001), which closely follows the proposed pipeline corridor from the Moab site to White Mesa Mill site south to near Wilson Arch. In that EIS, no risks for landslides, soil liquefaction, or collapsible soils were noted for the shared areas of these pipelines. Farther south on the proposed pipeline corridor, landslides are present in the Brushy Basin Member of the Morrison Formation on the north slope of the Sage Plain about 4 to 6 miles south of Church Rock (Harty 1991). Also, landslides occur in the Brushy Basin Member in the Recapture Wash area along the proposed pipeline (Harty 1991, 1993).

Expansive clay (montmorillonite), which can potentially cause engineering geologic problems when a change in water content causes shrinking and swelling, occurs in mudstones of the Brushy Basin Member of the Morrison Formation. The two main areas along the proposed pipeline corridor on this member, as noted by Mulvey (1992), are the Recapture Wash area and the area between Spanish Valley and Kane Springs.

#### **3.4.19.2 Soils**

For the purpose of soils discussion, this proposed pipeline corridor can be divided into two segments: Moab site to Peters Canyon, approximately 9 miles north of the city of Monticello (Maps 5 through 11, Appendix C), and Peters Canyon to the White Mesa Mill site (Maps 12 through 16, Appendix C). Peters Canyon marks a physiographic boundary between the lower-elevation canyon country of northern San Juan County and the rolling tableland of central San Juan County known as the Sage Plain. The head of Peters Canyon also marks a boundary between soils formed in semiarid and in subhumid climates (USDA 1962).

Four general soil map units or soil associations occur between the Moab and Peters Canyon segment of the pipeline corridor: Thoroughfare-Sheppard-Nakai, Begay-Moab-Redbank, Rizno Dry-Rock Outcrop, and Ustic Torriorthent-Ustic Calciorthids-Ustollic Haplargids (USDA 1991). The segment of the proposed pipeline corridor from Peters Canyon to the White Mesa Mill site crosses five general soil map units or soil associations in the higher, subhumid region of the Sage Plain, then drops into semiarid upland soil map units just south of the town of Blanding. The San Juan Area Soil Survey (USDA 1962) groups the soil series and soil map units as range sites based on land use and management. The soil types and potential natural vegetation for both of these pipeline corridor segments are described in the SOWP (DOE 2003).

#### **3.4.19.3 Ground Water**

Depth to ground water varies widely between Moab and the White Mesa Mill site. For the first 2 to 3 miles of the pipeline corridor southeast from the Moab site, ground water is shallow (within a few feet of the ground surface) in the Matheson Wetlands Preserve area of the Moab Valley. For the next approximately 10 miles, the pipeline corridor runs along the southwest flank of Spanish Valley in Quaternary alluvial fill and fan material, in which the depth to ground water is generally between 50 and 100 ft. In the approximately 3 miles between Spanish Valley and Kane Springs, the pipeline corridor crosses a higher elevation area that is underlain by the Salt Wash Member of the Morrison Formation, where depth to ground water is less than 100 ft. Except for a small area where shallow ground water is present in alluvium around the Hatch Wash crossing, ground water from Kane Springs south to about 2 miles south of Church Rock is in Entrada, Navajo, and Wingate Sandstones. As the pipeline corridor climbs southward up to the Sage Plain, ground water is in the Burro Canyon Formation and Dakota Sandstone. Ground water on

the Sage Plain, which extends south generally to Recapture Wash and in alluvium where the pipeline corridor crosses Verdure Creek and Devil Canyon, is less than 50 ft deep. From the shallow alluvial water at Recapture Wash south to the White Mesa Mill site, the pipeline corridor is underlain by shallow (less than 50 ft deep), perched ground water in alluvial Quaternary terrace gravels and ground water in the immediately underlying bedrock (Gloyn et al. 1995).

#### ***3.4.19.4 Surface Water***

The perennial waters that this pipeline corridor would either cross or affect include the Colorado River, Matheson Wetlands Preserve, Mill Creek, Pack Creek, Kane Springs Creek, Vega Creek, Montezuma Creek, Verdure Creek, Devil Canyon, Long Canyon, and Recapture Creek (these are shown on the segment reference maps in Appendix C).

The ephemeral/intermittent drainages that this pipeline corridor would either cross or affect are Muleshoe Canyon, West Coyote Creek, Joe Wilson Canyon, Hook and Ladder Gulch, Hatch Wash, Lightning Draw, Big Indian Wash, Sandstone Draw, Tank Wash, East Canyon, Peter's Canyon, South Canyon, Spring Creek, Halfway Hollow, Bull Hollow, Dodge Canyon, Whipstock Draw, Bullpup Canyon, Lem's Draw, Brown Canyon, and Corral Canyon. Numerous other smaller, unnamed drainages, all of which are intermittent, would also be affected (see the segment reference maps in Appendix C).

#### **Water Quality and Existing Surface Water Contamination**

None of the perennial water resources within the pipeline corridor are listed as "High Quality Waters" as defined by UDEQ regulations (UAC 2003b). However, water quality varies widely among many of the perennial surface-water resources identified within this pipeline corridor. As the pipeline corridor passes through higher elevations near the Verdure and Devil Canyon drainages south of Monticello, the water quality in these streams is higher than that observed in perennial water sources at lower elevations (e.g., the Colorado River at Moab, Recapture Creek at Blanding).

The seasonal washes located within this pipeline corridor are dry most of the year, and no water quality data are available. Flow occurs in these washes primarily after significant storm events. When storm water does flow through these washes, it is laden with sediments, and water quality is anticipated to be poor. Many of these ephemeral washes collect surface water runoff primarily from areas of Mancos Shale. Soils associated with the Mancos Shale are alkaline and may have high concentrations of selenium. As a result, surface water quality from these drainage features would likely be characterized as having high salinity, turbidity, hardness, and elevated levels of sulfate and selenium.

#### **Relevant Water Quality Standards**

All surface water bodies (both perennial and ephemeral) in this pipeline corridor are eventually tributaries to the Colorado River; therefore, they are subject to the water quality classifications specified in Utah Administrative Code R317-2-13 (see Chapter 7.0).

#### **3.4.19.5 Floodplains and Wetlands**

The White Mesa Mill pipeline would cross 11 perennial streams containing riparian vegetation and at least 21 intermittent drainages. The pipeline would also cross the Colorado River and the Matheson Wetlands Preserve. There have been previous utility crossings in the preserve, and the pipeline would follow these as closely as possible. Appendix F provides additional details relevant to the pipeline crossing.

#### **3.4.19.6 Terrestrial Ecology**

Section 3.4.9 describes the affected environment for terrestrial ecology for the White Mesa Mill site. This section addresses only the areas, wildlife, and habitat that may be affected by the proposed pipeline corridor (Maps 4 through 16, Appendix C). This transportation corridor is likely to support a greater diversity and abundance of vegetation and wildlife than the other pipeline routes. For example, the region near Monticello, north of the White Mesa Mill site, is dominated by the foothills life zone (transition zone), which ranges from 6,000 to 9,000 ft in elevation. Piñon-juniper forests and scattered ponderosa pine stands dominate this zone. General vegetation and wildlife information applicable to the regional descriptions as described in Section 3.4.9 is not repeated in this section.

Pronghorn antelope, mule deer, and bobcat occur along the proposed pipeline corridor and in the vicinity of the site, depending upon habitat type. The red fox, gray fox, badger, longtail weasel, desert cottontail, and black jackrabbit are known to occur along the southernmost segments of the corridor. Sagebrush communities along the route are home to many other species of small mammals, birds, and reptiles. Smaller mammals inhabiting the piñon-juniper woodland include raccoons, skunks, badgers, coyotes, woodrats, and deer mice. Bird species, including piñon jays and several species of raptors, also use the piñon-juniper habitat. Up to seven species of amphibians are thought to occur in riparian and wetland areas that may be within the pipeline corridor.

Critical habitat exists for several nonsensitive mammals and bird species along this segment of the pipeline corridor. The area that includes T. 30 S., R. 23 E. (Map 9, Appendix C) has been designated as critical habitat for the pronghorn antelope during fawning, and restrictions are in effect between May 15 and June 15 each year. Mule deer migration routes have been identified in T. 33 S. – T. 35 S., ranges to the east and west (Maps 11 through 14, Appendix C). Critical winter range is located in T. 35 S.–T. 37 S., (Maps 14 through 16, Appendix C) east of US-191, where restrictions are in effect from November 15 to April 30 each year.

The loggerhead shrike (*Lanius ludovicianus*) is typically found in open country, low scrub, and desert environments characteristic of the southernmost segments of the pipeline corridor. The gray vireo (*Vireo vicinior*) and virginia's warbler (*Vermivora virginiae*) may also exist in this area because they are commonly found in the foothills zone characterized by piñon-juniper forest, scrub oak, and open chaparral.

In March 2003, DOE requested an updated list of federally terrestrial threatened and endangered, proposed, or candidate species from USF&WS that may be present or affected by DOE's proposed alternatives. USF&WS responded in April 2003 with a list for San Juan County. Appendix A1, "Biological Assessment," provides more detailed information concerning these species. [Table 3–51](#) lists a subset of those species that may occur in the vicinity of the pipeline corridor between the White Mesa Mill site and the Moab site.

**Table 3–51. Federally Listed Threatened and Endangered Species Potentially Occurring in the Vicinity of the Proposed Pipeline Corridor**

Common Name	Scientific Name	Habitat Present and Affected	Species Present	Status	Comments
Navajo sedge	<i>Carex specuicola</i>	Possible	Possible	Threatened	
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Possible	Possible	Endangered	
Black-footed ferret	<i>Mustela nigripes</i>	No	No	Endangered	
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	No	No	Candidate	
Bald eagle	<i>Haliaeetus leucocephalus</i>	Possible	Possible	Threatened	Proposed for Delisting
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Possible	Possible	Threatened	
Gunnison sage grouse	<i>Centrocercus minimus</i>	Possible	Possible	Candidate	

All of the known populations of Navajo sedge in Utah are located at least 20 miles southwest of the White Mesa Mill site and associated borrow areas (UDWR 2003b). However, because the Navajo sedge requires wetland areas, it could potentially occur within the pipeline corridor where it crosses seeps and springs.

There was a reported southwestern willow flycatcher sighting in San Juan County in the vicinity of the slurry pipeline corridor (UDWR 2003b). However, there is no information on the date of the reported sighting or on whether the sighting was confirmed. Flycatchers could potentially occur along wetland areas of the pipeline corridor. It is currently unknown whether or not these wetland areas constitute suitable nesting habitat and/or whether they could be used as stopover habitat during migration.

Like the southwestern willow flycatcher, the Western yellow-billed cuckoo is also a riparian obligate. However, the cuckoo most likely does not occur along wetland areas of the pipeline corridor because associated areas of riparian vegetation are likely to be much smaller than that required by the cuckoo for nesting (100 to 200 acres of contiguous large gallery-forming or developing trees).

UDWR (2003b) reported a confirmed ferret sighting in the vicinity of the White Mesa Mill site in 1937. However, all black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur in the vicinity of the pipeline between the White Mesa Mill site and the Moab site. However, black-footed ferrets depend almost exclusively on prairie dog colonies for food, shelter, and denning. The area from Moab south along US-191 toward the White Mesa Mill site supports colonies of Gunnison's prairie dog (Seglund 2004). It is unknown to what extent individual colonies or a combination of these colonies could support black-footed ferrets.

The Utah Gap Analysis (UDWR 1999) indicates that potential high-quality bald eagle wintering habitat exists throughout many of the project areas, and bald eagles are common between Monticello and Blanding (Maps 12 through 14, Appendix C) during winter months. However, bald eagles are not currently known to night roost (or nest) near the route proposed for the pipeline corridor between the White Mesa Mill site and the Moab site.

Designated critical habitat for the Mexican spotted owl occurs within 2 miles of the pipeline corridor just south (within 25 miles) of the Moab site. Data provided by UDWR (2003a) indicated that there were no occurrences of the Mexican spotted owl in any of the project areas. However, based on proximity to critical habitat, spotted owls could potentially occur within 2 miles of the pipeline corridor just south (within 25 miles) of the Moab site.

The pipeline corridor between the White Mesa Mill site and the Moab site is within a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000). High quality habitat for the Gunnison sage grouse has been designated in T. 31 S.–T. 33 S., R. 24 E. (Maps 10 and 11, Appendix C).

Besides that noted above for the Mexican spotted owl, there is no designated or proposed critical habitat for any of the other federally protected species in the vicinity of the pipeline corridor between the White Mesa Mill site and the Moab site.

No threatened or endangered amphibians or reptiles are believed to be present within the area of the pipeline corridor (Dames and Moore 1978; UDWR 2003b).

DOE, in consultation with USF&WS and BLM, would determine the need for additional habitat evaluations and surveys for species that could be affected by the proposed action should this alternative be selected.

As previously discussed, special status species are those that are protected under federal and state regulations other than the ESA, which include the MBTA, Executive Order 13186, and Birds of Conservation Concern (USF&WS 2002f). The State of Utah and federal land management agencies maintain a list of species that they consider threatened, endangered, or sensitive or otherwise of concern. By letter dated May 30, 2003, UDWR identified several species of state concern, which included BLM- and USFS-identified species. However only those listed by USF&WS under the ESA are included in Section 7 consultations or in the Biological Assessment. Although the special status species are not covered by the ESA, the State of Utah, BLM, USFS, and USF&WS encourage protection of these species.

[Table 3–52](#) lists sensitive plant species considered by state and federal resource management agencies to be of concern that may occur in the vicinity of the pipeline corridor. A number of the species listed are potentially present in the vicinity of the corridor; in some cases the known population locations or suitable habitat may not be close to the site.

[Table 3–53](#) lists animal species considered by state and federal resource management agencies as endangered, threatened, or otherwise of concern that may be present in the vicinity of the pipeline corridor. A number of the species listed are potentially present in the vicinity of the corridor; in some cases the known population locations or suitable habitat may not be close to the site.

[Table 3–54](#) lists bird species, including migratory birds, that may occur in the vicinity of the corridor, although on-site habitat limits typical nesting and breeding activities. Most of these species are protected under the MBTA, which prohibits take or destruction of birds, nests, or eggs of listed migratory birds.

The Abert's squirrel (*Sciurus aberti*) and burrowing owl are of primary concern along the pipeline corridor. Ponderosa pine stands in the vicinity of T. 35 S., R. 23 and R. 24 W. (Map 14, Appendix C) likely provide habitat for Abert's squirrel and many sensitive avian species. Burrowing owl habitat has been identified within T. 30 S., R. 23 and R. 24 E., (Map 9, Appendix C) and seasonal restrictions may apply; however, no critical habitat exists within the pipeline corridor.

#### **3.4.19.7 Land Use**

The proposed pipeline corridor south from the Moab site to the White Mesa Mill site is approximately 89 miles and would cross federal, State, and private land. Where possible, the pipeline would be constructed in the existing right-of-way. Where co-location was not possible or practical, the slurry pipeline would parallel existing rights-of-way. Approximately 27 percent of the corridor is administered by BLM and the USFS. Approximately 54 percent of the route is located on private and Nature Conservancy lands; the remaining 19 percent is under the jurisdiction of the State, including wildlife reserves.

#### **3.4.19.8 Cultural Resources**

The cultural history of the White Mesa Mill pipeline route is discussed in the more general cultural history of southeastern Utah described in Section 3.1.13.1; the Class I cultural resource inventory that was conducted for the corridor is described in Section 3.1.13.2.

The Class I inventory (Davis et al. 2003) indicates that Class III surveys have been conducted along most of the proposed pipeline route. An approximately 1.5-mile section of the pipeline corridor north and south of the proposed pumping station (Map 8, Appendix C) has not been surveyed, and an approximately 8.5-mile section of the pipeline corridor from Dodge Point (Map 13, Appendix C) to Mustang Mesa (Map 15, Appendix C) has not been completely surveyed. Davis et al. (2003) estimate that, within these unsurveyed areas, approximately 127 sites per square mile could be expected to occur. Of the 127 sites, approximately 79 percent, or 100 sites, would be eligible for inclusion in the National Register of Historic Places.

Within the 1-mile-wide corridor along the entire pipeline corridor, approximately 203 cultural sites have been documented. Of this total, approximately 104 are considered eligible for inclusion in the National Register of Historic Places. [Table 3–55](#) summarizes the types of cultural sites that are eligible for inclusion. The time periods represented by the sites range primarily from the prehistoric Archaic to the Pueblo III periods (7000 B.C.–A.D. 1300); however, the protohistoric and historic periods are represented by a number of sites.

A distinctive trend in cultural site densities occurs north to south along the length of the pipeline corridor. In the northern 10-mile section of the corridor, between Moab and the southern end of Spanish Valley (Map 6, Appendix C), typical site densities are 2.9 sites per linear mile. This area lacks the physical attributes that are deemed essential for long-term prehistoric habitation. Accordingly, the types of cultural sites documented in this section indicate a relatively transient use by prehistoric and protohistoric groups.

*Table 3–55. White Mesa Mill Pipeline—Summary of Eligible Cultural Sites by Type*

Site Type	Number of Sites
Temporary Camp	17
Long-Term Camp	1
Habitation Site	13
Limited Activity Site	21
Granary	7
Rock Art	1
Quarry	10
Road	5
Homestead	1
Unknown	28
<b>Total</b>	<b>104</b>

Along the middle section of the pipeline corridor, between the southern end of Spanish Valley and Peters Canyon (Map 10, Appendix C), cultural site densities average 8 sites per linear mile. This area contains a wide variety of bedrock exposures containing rock types that were exploited by prehistoric groups for the manufacturing of stone tools. The types of cultural sites documented in this area indicate that prehistoric groups used this area primarily for short-term activities such as lithic quarrying, tool manufacturing, and hunting and gathering of local natural resources.

The southern section of the pipeline corridor, between Peter’s Canyon and the White Mesa Mill site, contains the highest density of cultural sites along the corridor. Within this section of the corridor, Class III surveys have been incomplete or nonexistent. As previously noted, Davis et al. (2003) estimated densities of approximately 127 sites per square mile in the Dodge Point/Mustang Mesa area. In the Recapture Wash area north of Blanding, archaeologists (Davis et al. 2003) documented an average of 56 cultural sites per square mile, and on White Mesa, Davis et al. (2003) documented an average of 34 cultural sites per square mile.

Recent interviews (Fritz 2004) with tribal members indicate that at least one potential traditional cultural property, a sacred ceremonial site, associated with the Ute Tribe exists along the proposed pipeline corridor. This is a “potential” traditional cultural property because its eligibility for National Register status has yet to be determined; this determination would be made during the Section 106 consultation process. The potential for the existence of additional traditional cultural properties and their estimated density are extremely high (on a scale of low-medium-high-extremely high); such properties would likely be associated with the Ute Tribe, Navajo Nation, and Hopi Tribe (Fritz 2004). Traditional cultural properties along the route may include sacred gathering areas, sacred healing areas, sacred springs, and burial areas.

#### **3.4.19.9 Visual Resources**

The 87-mile-long proposed pipeline corridor between the Moab and White Mesa Mill sites passes through areas designated primarily as Class III by BLM (see Section 3.1.15 for an explanation of visual resource classes). Approximately 20 percent of the route is classified as Class IV (south of Monticello and south of Blanding), and approximately 5 percent of the route is classified as Class II (Kane Springs Canyon, approximately 10 miles southeast of Moab; Long Canyon, approximately 10 miles northeast of Blanding; and Recapture Creek, approximately 3.5 miles northeast of Blanding).

A variety of visual settings occur throughout the Class III areas. Between Moab and Monticello, much of the landscape is characterized by gently to moderately rolling terrain that is abruptly dissected by dry, rocky arroyos. The predominantly red sandy soils are covered by moderately sparse vegetation composed of sagebrush, rabbitbrush, bunchgrasses, cheatgrass, piñon-pine, and juniper. Interspersed among the rolling hills are numerous red and beige sandstone outcrops, some occurring as isolated butte-like “islands” and others appearing as linear ridges and cliffs. Between Monticello and Blanding, the Class III areas are characterized more by rough-textured hills, ridges, and valleys that are thickly vegetated with sagebrush, piñon-pine, and juniper.

The Class IV areas south of Monticello and south of Blanding have been culturally modified by farming and ranching. The landscape is a gently to moderately rolling patchwork of plowed fields, green pastures, and cultivated wheat and alfalfa fields. Soils are predominantly red or dark reddish brown.

The Class II areas—Kane Springs Canyon, Long Canyon, and Recapture Creek—are characterized by steep, dissected canyons. The Kane Springs Canyon area contains the rugged red and beige ridges and cliffs of the Entrada Sandstone. These rocky ridges are sparsely vegetated with sagebrush and juniper. The canyons of Long Canyon and Recapture Creek are formed by the somewhat less rugged sandstone ridges and cliffs of the Burro Canyon Formation and Dakota Sandstone. The yellow-brown and tan rocks of these strata are covered with moderately dense piñon and juniper. [Figure 3–44](#) and [Figure 3–45](#) are photographs of the proposed pipeline crossings within Kane Springs Canyon and Recapture Creek, respectively.

Approximately 25 percent of the pipeline corridor, including those portions that cross Kane Springs Canyon and Recapture Creek, is visible to travelers on US-191. A 3- to 4-mile segment of the route that skirts the southwestern slope of Spanish Valley (Map 5, Appendix C) is visible to Moab residents and local traffic. The remaining 75 percent of the route is not visible to the general public.

### **3.5 Borrow Areas**

Different types of borrow materials would be needed for cover materials. These materials range from silts and clays to riprap, or rock materials, that would be used to armor the sides of the disposal cell. Borrow areas that would provide these materials have been identified for each disposal alternative (see Figure 2–8). In some cases, a proposed borrow area would be used for more than one disposal alternative. Two of the proposed borrow areas (LeGrand Johnson and Papoose Quarry) are existing quarries, and specific information on rock materials present has been well documented. The proposed Floy Wash borrow area is near pits previously used by UDOT for highway materials. All other proposed borrow sources were selected on the basis of geologic reports and have not been field tested.

Once a disposal site was selected, the proposed borrow areas for that site would be evaluated for suitability by digging test pits and sampling boreholes. Borrow areas selected for analysis constitute an area larger than would be used. This would allow a contractor enough area to adequately test and configure the borrow area for project needs. For example, if the actual deposit of borrow material were not as deep as anticipated, a larger surface area would be required than if the deposit were thicker than anticipated. A larger area also would allow the contractor greater flexibility to avoid any sensitive resources encountered. Figure 2–8 shows the locations of the borrow areas.

### **3.5.1 Crescent Junction Borrow Area**

The Crescent Junction borrow area is within the area designated as the Crescent Junction site area and, therefore, shares resource characteristics described in Section 3.3.

The general area is underlain by thick Mancos Shale that is composed primarily of mudstone with scattered thin beds of bentonite. The shallowest ground water is 3,000 ft deep in the Dakota Sandstone. No wetlands or federally regulated floodplains are present in this borrow area; however, during large storms, the nearby Crescent Wash will carry heavy flows of an indeterminate volume and lateral extent.

Air quality in this borrow area is expected to be similar to that described for the Moab, Crescent Junction, and Klondike Flats site alternatives. The Moab region is classified as an attainment area under the NAAQS (see Section 3.1.4 for further detail).

Wildlife diversity and densities are similar to those described in Section 3.3.9 and would be considered limited because of the semiarid climate, vegetation types, and habitat types present. However, the proximity of the Book Cliffs could increase the potential for cliff-dwelling raptors being present. Of the state listed sensitive species that are also protected under the MBTA, the ferruginous hawk and peregrine falcon are of primary concern. No important habitat has been identified for these or other non-federally protected wildlife species close to the Crescent Junction borrow area.

The Crescent Junction borrow area is located within the Crescent Junction site. Of the federally protected species listed in Table 3–32, the endangered black-footed ferret and white-tailed prairie dog (currently under review for federal listing) could potentially occur on and/or in the vicinity of the Crescent Junction borrow area.

UDWR (2003b) reported an unconfirmed sighting of the black-footed ferrets in the vicinity of the Crescent Junction borrow area in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the Crescent Junction borrow area.

White-tailed prairie dog colonies around the Crescent Junction borrow area form a complex of colonies ranging in size from 10 acres to 2,445 acres (Seglund 2004). It is unknown to what extent individual colonies or a combination of colonies could support black-footed ferrets.

There is no designated or proposed critical habitat for the black-footed ferret in the vicinity of the Crescent Junction borrow area.

DOE, in consultation with USF&WS and BLM, would determine the need for habitat evaluations and surveys for species that may be affected.

The area surrounding the Crescent Junction borrow area is largely unpopulated. The nearest resident lives southeast of the I-70 interchange with US-191. Many unimproved dirt roads traverse the open country, and dispersed recreation, grazing, and oil and gas leasing occur in the general area, as described in Section 3.3.10.

Results of a Class I cultural resource inventory indicate that Class III cultural resource surveys have not been conducted at this site. Predictive modeling involving soil type and landform (Berry 2003) indicates that 1.9 cultural sites per square mile could be expected to occur within the borrow area. No data exist concerning the presence of potential traditional cultural properties on or near the borrow area. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of occurrence and their estimated density on the site are low (on a scale of low-medium-high-extremely high).

County, federal, and state road access to the general site area is described in Section 3.1.17 and is shown on Figure 3–21. There is no direct access to this borrow area from the Crescent Junction interchange with I-70, and it is anticipated that roads would need to be constructed for access to the borrow materials. If the materials were used for the Crescent Junction site alternative, only minor road improvements would be required. However, if these materials were used for another disposal site alternative, roads would need to be constructed from Crescent Junction or from the proposed Williams Crescent Junction terminal to access US-191.

### **3.5.2 Floy Wash Borrow Area**

The Floy Wash borrow area is in an area that has been previously used by UDOT for borrow materials. It is located about 7 miles west-southwest of Crescent Junction just south of I-70. Material from the existing pits is from terrace gravel deposits that are up to 20 ft thick. The terrace deposits contain gravel composed of quartzite, chert, limestone, and sandstone rock types derived from sources in the Book and Roan Cliffs to the north. The terrace deposits overlie the 3,000-ft-thick Mancos Shale and are underlain by the water-bearing Dakota Sandstone. A single, ephemeral wash, Floy Wash, is immediately adjacent to the area. No perennial streams, wetlands, or federally regulated floodplains are located within the borrow area. A more detailed description of potential riparian resources is included in Appendix F, “Floodplain and Wetlands Assessment and Floodplain Statement of Findings for Remedial Action at the Moab Site.” Minor use of surface water is limited to wildlife and livestock watering during and immediately after storms.

Soils at the Floy Wash site are classified as Mesa-Trook complex (SCS 1989) and are formed on mixed alluvium and fan pediments and terraces derived predominantly from sandstone and conglomerate. These soils are very deep, well-drained, fine sandy loams near the surface; below a depth of about 24 inches, they become very gravelly fine sandy loam.

Vegetation commonly supported on these soils consists of shadscale, galleta grass, Indian ricegrass, and fourwing saltbush. Vegetation observed during a site visit in April 2003 was dominated by phacelia and prickly pear cactus and reflects the history of the site as a gravel quarry. Other species observed include milkvetch, kochia, Gardner saltbush, mat saltbush, bud sagebrush, galleta, globemallow, and cheatgrass.

Depending on the condition of the plant community, wildlife species that may inhabit this area include game species such as antelope and chukar. Desert cottontail, black-tailed jackrabbit, and various other small mammal species may also find suitable habitat in this area. Coyote, red-tailed hawks, golden eagles, and northern harriers may find suitable hunting grounds on the Mesa-Trook soils.

Wildlife population diversity and densities are similar to those described for the Klondike Flats site (Section 3.2.8). Vegetation and habitat are limited and, therefore, limit species diversity. The proximity to I-70 may also limit species diversity.

The general area consists of land administered by BLM and interspersed with SITLA lands. This site is within the existing Athena grazing allotment. Immediate access off I-70 is available, although CR-334 is a backcountry dirt road that is part of the old highway alignment and would connect to US-191, as described in Section 3.1.17 and shown on Figure 3–21.

The Floy Wash borrow area is located nearest to the Crescent Junction site. Of the federally protected species listed in Table 3–32, the endangered black-footed ferret and white-tailed prairie dog (currently under review for federal listing) could potentially occur on and/or in the vicinity of the Floy Wash borrow area.

UDWR (2003b) reported an unconfirmed sighting of the black-footed ferrets in the vicinity of the Floy Wash borrow area in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the Floy Wash borrow area.

White-tailed prairie dog colonies around the Crescent Junction area, located a few miles east of the Floy Wash borrow area, form a complex of colonies ranging in size from 10 to 2,445 acres (Seglund 2004). It is unknown to what extent individual colonies or a combination of colonies could support black-footed ferrets.

There is no designated or proposed critical habitat for the black-footed ferret in the vicinity of the Floy Wash borrow area.

Results of Class I cultural resource inventories indicate that Class III surveys have not been conducted for this site. However, on the basis of predictive modeling involving soil type and landform (Berry 2003), it is estimated that 2.7 cultural sites per square mile could be expected to occur within the borrow area. No data exist concerning the presence of potential traditional cultural properties on or near the borrow area. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of occurrence and their estimated density on the site are low (on a scale of low-medium-high-extremely high).

Noise levels at this site are expected to be comparable to noise levels associated with open desert areas. Vehicles on I-70 would constitute the nearest sources of man-made noise. However, activity at an existing borrow pit could also influence background noise levels. The site is situated on a broad, rolling, desert plain; it is sparsely vegetated with saltbush, cheatgrass, and prickly pear cactus. A 10- to 15-ft cut face exposes the types of borrow materials present. Around the site, distant canyons, buttes, and mesas form the background scenery. BLM assigns this area a Class III visual resource designation (Sweeten 2003) (Section 3.1.15 explains visual resource classes.) The borrow area is visible from I-70 and would be considered remote from populations.

### **3.5.3 Courthouse Syncline Borrow Area**

The Courthouse Syncline borrow area is located several miles northwest of the Klondike Flats site. It is near the junction of Thompson and Crescent Washes in a broad open area of poorly developed drainages, where alluvial mud deposits less than 20 ft thick cover the surface. In addition to the alluvial mud deposits, some coarser-grained alluvial material (sand and gravel) also covers the surface of part of the site; this material has been transported from the Book Cliffs

down Thompson Wash. The geologic setting at the borrow area is similar to that at the Klondike Flats site. The only significant difference is that the Mancos Shale beneath the borrow area is more than 1,000 ft thick and several hundred feet thicker than at the Klondike Flats site. Section 3.2 provides general background information on this area.

Thompson and Crescent Washes are considered ephemeral and are tributaries to Tenmile Wash, which is a tributary to the Green River. Both washes are dry most of the year and are typical of the drainage features in this area. Flows occur only after large storms. Use of surface water from these drainage features is limited to wildlife and livestock watering during and immediately after storms. No perennial streams, wetlands, or federally regulated floodplains are known to exist in the borrow area, but nearby Thompson and Crescent Washes contain potential riparian vegetation (see Appendix F).

Air quality in this borrow area is expected to be similar to that described for the Moab, Crescent Junction, and Klondike Flats sites. The Moab region is classified as an attainment area under the NAAQS (see Section 3.1.4 for further detail).

Wildlife resources are similar to those described for the Klondike Flats site and are limited by the limited vegetation and habitat present. However, an ephemeral wash on the southern perimeter of the site may provide cover and habitat for small mammals. No critical winter or summer range has been identified for wildlife in this area.

This area is currently open rangeland (Little Grand grazing allotment) administered by BLM. No residential areas or roads provide access. Area access is described in Section 3.1.17 and shown on Figure 3–21.

The Courthouse Syncline borrow area is located nearest to the Klondike Flats site. Of the federally protected species listed in Table 3–25, the endangered black-footed ferret and white-tailed prairie dog (currently under review for federal listing) could potentially occur on and/or in the vicinity of the Courthouse Syncline borrow area.

UDWR (2003b) reported an unconfirmed sighting of black-footed ferrets in the vicinity of the Courthouse Syncline borrow area in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the Courthouse Syncline borrow area.

Surveys for white-tailed prairie dogs have been conducted at the Klondike Flats site (BLM 1995). At that time, it was determined that all of the colonies were relatively small and isolated, such that they would not support black-footed ferrets.

There is no designated or proposed critical habitat for the black-footed ferret in the vicinity of the Courthouse Syncline borrow area.

DOE, in consultation with USF&WS and BLM, would determine the need for habitat evaluation and surveys for species that may be affected.

Results of a Class I cultural resources inventory indicate that Class III cultural resource surveys have not yet been conducted in this area. Predictive modeling involving soil type and landform

(Berry 2003) indicates that 22.4 to 27.4 cultural sites per square mile could be expected to occur within the borrow area. No data exist concerning the presence of potential traditional cultural properties on or near the borrow area. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of their occurrence and estimated density on the site are low (on a scale of low-medium-high-extremely high).

This borrow area is remotely located on a flat to gently rolling alluvial plain that is dotted with greasewood shrubs and small bunches of grasses and forbs. Small-scale dune-like features on the soil surface, formed by winds, are prevalent throughout the site. Far north of the site and forming the horizon are the Book Cliffs, a linear geologic feature that trends east-west from Grand Junction, Colorado, to Price, Utah. BLM assigns this area a Class III visual resource designation (Sweeten 2003). The site is not visible to the public.

Neither background noise nor ground vibration data are available for the Courthouse Syncline borrow area. Noise levels at the Courthouse Syncline borrow area are expected to be comparable to noise levels associated with open desert areas, typically 22 to 38 dBA. The nearest source of man-made noise is traffic on US-191; however, the borrow area is 2.75 miles west of the highway and the contribution of noise to the background noise at the borrow site is minimal (less than 40 dBA). Railroad traffic on the Union Pacific rail line that runs parallel to US-191 also has a low potential to contribute to background noise and ground vibration.

### **3.5.4 Klondike Flats Borrow Area**

This borrow area is within the Klondike Flats site. Section 3.2 describes the resources present. Of the federally protected species listed in Table 3–25, the endangered black-footed ferret and white-tailed prairie dog (currently under review for federal listing) could potentially occur on and/or in the vicinity of the Klondike Flats borrow area.

UDWR (2003b) reported an unconfirmed sighting of the black-footed ferret in the vicinity of the Klondike Flats borrow area in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the Klondike Flats borrow area.

Surveys for white-tailed prairie dogs have been conducted at the Klondike Flats site (BLM 1995). At that time, it was determined that all of the colonies were relatively small and isolated, such that they would not support black-footed ferrets.

There is no designated or proposed critical habitat for the black-footed ferret in the vicinity of the Klondike Flats borrow area.

### **3.5.5 Tenmile Borrow Area**

The Tenmile borrow area is located about 7 miles west of the Klondike Flats site. Rocks on the area surface are sandstones that are nearly flat lying; they consist of the Dewey Bridge Member of the Carmel Formation and the Slick Rock Member of the Entrada Sandstone. Other than small areas where sandstone is exposed, most of the area is covered by eolian sand. Ground water in the area is present at shallow depths (200 ft or less) in the Navajo Sandstone; springs emerge in draws near this site where the top of the Navajo Sandstone is exposed. No ephemeral or

perennial surface water features or resources have been identified within this area, but Tenmile Wash, an ephemeral stream with potential riparian and/or wetland resources, exists nearby (see Appendix F). Section 3.2 provides general background information on this area.

Soils and potential natural vegetation at the Tenmile borrow area are classified as Nakai fine sandy loam, described previously in Sections 3.2.1 and 3.2.2. However, approximately 25 percent of Nakai sandy loam at the Tenmile borrow area is covered with stabilized and active parabolic dunes consisting of fine sand. Ephedra is the common dune stabilizer in the area. Other common plants are sand sage, hopsage, Indian ricegrass, and wild buckwheat in fine sand areas and fourwing saltbush, jimmyweed, rabbitbrush, galleta, and yucca in sandy loam areas. Tamarisk and greasewood occur in areas with relatively shallow ground water.

Air quality in this area is expected to be similar to that described for the Moab, Crescent Junction, and Klondike Flats sites. The Moab region is classified as an attainment area under the NAAQS (see Section 3.1.4 for further detail).

Wildlife population diversity and densities in the vicinity of this site are similar to those described for the Klondike Flats site in Section 3.2.8. Because of the level of recreational activity in this area, densities may be further limited seasonally. No critical winter or summer range has been identified for wildlife in this area. Of the identified threatened, endangered, or sensitive species potentially present, the black-footed ferret is the primary species of concern. No critical habitat is present in this area.

The Tenmile borrow area is located nearest to the Klondike Flats site. Of the federally protected species listed in Table 3–25, the endangered black-footed ferret and white-tailed prairie dog (currently under review for federal listing) could potentially occur on and/or in the vicinity of the Tenmile borrow area.

UDWR (2003b) reported an unconfirmed sighting of the black-footed ferret in the vicinity of the Klondike Flats site in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the Tenmile borrow area.

Surveys for white-tailed prairie dogs have been conducted at the Klondike Flats site (BLM 1995). At that time, it was determined that all of the colonies were relatively small and isolated, such that they would not support black-footed ferrets.

There is no designated or proposed critical habitat for the black-footed ferret in the vicinity of the Tenmile borrow area.

DOE, in consultation with USF&WS and BLM, would determine the need for habitat evaluations and surveys for species that may be affected.

Land in the area is administered by BLM. Blue Hills Road is the major access to this site, although the area is laced with interconnecting backcountry roads and trails. There is high recreational use in the general area. Traffic counters placed on Blue Hills Road received up to 80 vehicle counts per day over a 1-month period, indicating that at least 80 individuals accessed

this area daily over the period of record. Other uses in the area include grazing and oil and gas leasing. The nearest residence is approximately 9 miles east at the Canyonlands Field Airport.

Results of a Class I cultural resources inventory indicate that Class III cultural resource surveys have not yet been conducted in this area. Predictive modeling involving soil type and landform (Berry 2003) indicates that 22.4 to 27.4 cultural sites per square mile could be expected to occur within the borrow area. No data exist concerning the presence of potential traditional cultural properties on or near the borrow area. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of their occurrence and estimated density on the site are low to medium (on a scale of low-medium-high-extremely high).

Neither background noise nor ground vibration data are available for the Tenmile borrow area. Noise levels at the Tenmile borrow area are expected to be comparable to noise levels associated with open desert areas, typically 22 to 38 dBA. The nearest source of man-made noise is traffic on US-191. The borrow area is about 8 miles from US-191, and no contribution of highway noise to the background noise at the borrow site is expected. Railroad traffic on the Union Pacific rail line that runs parallel to US-191 also has a little potential to contribute to background noise and ground vibration.

This borrow area is situated on gently rolling topography that is capped by small, hummocky sand dunes. Scattered sand sage shrubs, bunch grasses, and desert primrose impart a rough texture to the lands and create a pleasing contrast to the pale red soils. Dominating the near-background are steep sandstone cliffs striated with red, beige, and tan rock strata. BLM currently assigns this area a Class IV visual resource designation (Sweeten 2003). This borrow area is highly visible to travelers on the adjacent road.

Access to the general area is described in Section 3.1.17 and shown on Figure 3–21.

### **3.5.6 Blue Hills Road Borrow Area**

The Blue Hills Road borrow area is located about 4 miles south of the Klondike Flats site. A variety of rock types composing the Cedar Mountain Formation are exposed at this site. These rock types include mudstone, sandstone, gritstone, conglomerate, and limestone. Alluvial and eolian deposits cover bedrock in some areas within this borrow area. Ground water is at least 600 ft deep in the Entrada and Navajo Sandstones. Section 3.2 provides general background information on this area.

Soils at the Blue Hills Road borrow area are classified as Nakai fine sandy loam and the Toddler-Ravola-Glenton association. These soils and the potential natural vegetation are described in Sections 3.2.1 and 3.2.2.

A single, unnamed ephemeral wash, a tributary to Bartlett Wash and, therefore, to the Colorado River, is within the boundary of disturbance identified for this borrow area. No perennial surface waters, wetlands, or federally regulated floodplains are present within the boundaries of the borrow area, but a small spring with associated wetland vegetation exists directly adjacent to the southwestern boundary (see Appendix F).

Air quality in this area is expected to be similar to that described for the Moab, Crescent Junction, and Klondike Flats site alternatives. The Moab region is classified as an attainment area under the NAAQS (see Section 3.1.4 for further detail).

Wildlife population diversity and densities in the vicinity of this borrow area are similar to those already described for the Klondike Flats site (see Section 3.2.8). Because of the high level of recreational activity in the area and proximity of Blue Hills Road, densities and diversity are further limited. No critical winter or summer range has been identified for wildlife in this area.

The Blue Hills borrow area is located nearest to the Klondike Flats site. Of the federally protected species listed in Table 3–25, the endangered black-footed ferret and white-tailed prairie dog (currently under review for federal listing) could potentially occur on and/or in the vicinity of the Blue Hills borrow area.

UDWR (2003b) reported an unconfirmed sighting of black-footed ferrets in the vicinity of the Klondike Flats site in 1989. All black-footed ferrets currently in the wild are believed to be the result of a federal reintroduction program. It is highly unlikely that the black-footed ferrets reintroduced in Uinta and Duchesne Counties in 1999 or their offspring could occur on or in the vicinity of the Blue Hills borrow area.

Surveys for white-tailed prairie dogs have been conducted at the Klondike Flats site (BLM 1995). At that time, it was determined that all of the colonies were relatively small and isolated, such that they would not support black-footed ferrets.

There is no designated or proposed critical habitat for the black-footed ferret in the vicinity of the Blue Hills borrow area.

DOE, in consultation with USF&WS and BLM, would determine the need for habitat evaluation and surveys for species that may be affected.

Oil and gas leases are in the area, but no oil or gas leases are currently active. A potassium permit was issued in 2001. Grazing occurs within the Arth's Pasture Grand grazing allotment. The closest residential property is adjacent to the Canyonlands Field Airport, approximately 3 miles east.

Results of a Class I cultural resource inventory indicate that Class III cultural resource surveys have not been conducted at this site. Predictive modeling involving soil type and landforms (Berry 2003) indicates that 1.9 to 27.4 cultural sites per square mile could be expected to occur within the borrow area. No data exist concerning the presence of potential traditional cultural properties on or near the borrow area. On the basis of Class I cultural resource inventory results, tribal interviews, and published and unpublished literature, the likelihood of occurrence and their estimated density on the site are low (on a scale of low-medium-high-extremely high).

Neither background noise nor ground vibration data are available for the Blue Hills Road borrow area. Noise levels at the Blue Hills Road borrow area are expected to be comparable to noise levels associated with open desert areas, typically 22 to 38 dBA. The nearest source of man-made noise is traffic on US-191. The borrow area is about 3 miles from the highway, and the contribution of noise to the background noise at the borrow site is minimal. Railroad traffic on

the Union Pacific rail line that runs parallel to US-191 also has a low potential to contribute to background noise and ground vibration.

This borrow area is located on a smooth, flat, desert plain with evenly scattered bunchgrasses and forbs. The light- and dark-green plants form a moderate contrast with the pale, reddish-beige soils. In the immediate background, steep hillsides rise from the valley floor and form conical and horizontal features. BLM assigns this area a Class III visual resource designation (Sweeten 2003). This site is visible to travelers on Blue Hills Road.

### **3.5.7 LeGrand Johnson Borrow Area**

This privately owned existing commercial gravel pit is located about 8 miles south of Moab along US-191 in Spanish Valley (see Figure 2–8). It has an estimated available volume of 600,000 yd<sup>3</sup> of sand, gravels, and road base materials. No federally protected species are known to occur at the LeGrand Johnson borrow area.

### **3.5.8 Papoose Quarry Borrow Area**

This existing commercial quarry, operated by the Cotter Corporation on state lands, has an estimated available large rock volume of 13 million yd<sup>3</sup>. It is located in Lisbon Valley south of SR-46 and at the intersection of CR-113 and CR-370 (see Figure 2–8). No federally protected species are known to occur at the Papoose Quarry borrow area.

### **3.5.9 Blanding Borrow Area**

This borrow area, located north of the White Mesa Mill site and northeast of Blanding, is near existing sand and gravel pits. Section 3.4 provides area resource information.

Recapture Creek, a perennial stream, is located within this site area. Surface flow information is unavailable. There is also an intermittent stream present, and both it and Recapture Creek are vegetated by tamarisk, cottonwood, willow, and shrub oak (BLM 2003c). These streams would need a more detailed water resource inventory should this site be chosen. Wildlife present is believed to be similar to that described in Section 3.4.9. Compared to other borrow areas under consideration, this site is believed to support greater diversity and abundance of wildlife. Mule deer migration routes have been identified south of this site in T. 33 S. to T. 35 S. and within ranges both east and west of US-191. Critical winter range is found in T. 35 S. to T. 37 S. and in ranges east of US-191. Restrictions are in effect from November 15 to April 30 of each year.

Of the federally protected species that could be potentially present in the Blanding borrow area (Table 3–51), the Gunnison sage grouse, a federal candidate species, is of primary concern. The Blanding borrow area lies within a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000). High quality habitat for the Gunnison sage grouse has been designated in T. 31 S.–T. 33 S., R. 24 E. (Maps 10 and 11, Appendix C). The burrowing owl may also be present in the Blanding borrow area.

This site is easily accessible from US-191 (see Section 3.4.15) and is on land administered by BLM. It is within a designated transportation and utility corridor and is open to off-highway vehicle use. Other existing uses include grazing and mineral, oil, and gas leasing.

The cultural history of the Blanding borrow area is included in the more general cultural history of southeastern Utah described in Section 3.1.13.1.

Results of the Class I inventory indicate that Class III cultural resource surveys have not been completed for most of the Blanding borrow area. However, one Pueblo II (A.D. 900–1150) habitation site, eligible for inclusion in the National Register of Historic Places, has been documented in the area. On the basis of nearby archaeological surveys (Davis et al. 2003), it is estimated that approximately 56 cultural sites (or 45 sites eligible for inclusion in the National Register of Historic Places) per square mile could be expected to occur within or near the borrow area. The Blanding borrow area is an important plant gathering area for White Mesa Utes and is important to the traditional route from Allen Canyon/Cottonwood Wash area to the White Mesa community. Recent interviews (Fritz 2004) with tribal members indicate that at least two potential traditional cultural properties associated with the Ute Tribe exist on or near the proposed borrow area. These are “potential” traditional cultural properties because their eligibility for National Register status has yet to be determined; this determination would be made during the Section 106 consultation process. In this area, the likelihood of occurrence of traditional cultural properties and their estimated density are extremely high (on a scale of low-medium-high-extremely high) and are likely associated with the Ute Tribe, Navajo Nation, and Hopi Tribe (Fritz 2004). Traditional cultural properties on or near the site may include sacred gathering areas, sacred ceremonial sites, sacred healing areas, sacred springs, and burial areas.

Neither background noise nor ground vibration data are available for this borrow area. Noise levels at the IUC off-site borrow area are expected to be comparable to noise levels associated with open desert areas, typically 22 to 38 dBA. The nearest source of man-made noise is traffic on US-191 that passes through the northern part of this site. The community of Blanding is located about 1 mile from the southwest corner of the site. Background noise levels at the site would be influenced by traffic on US-191 and could raise noise levels to about 60 dBA measured 50 ft from roadside. There are no rail lines near the borrow area.

This site is located on a hilltop overlooking US-191. The beige soil material within the existing open borrow pits contrasts sharply with the smooth, rolling, dark-green hills surrounding the site. BLM assigns this area a Class III visual resource designation (Sweeten 2003). The site is currently visible for approximately 5 to 10 seconds to southbound travelers on US-191. Northbound travelers do not see the site.

### **3.5.10 White Mesa Mill Borrow Area**

The White Mesa Mill borrow area is located south of Blanding within the IUC property boundary. This borrow area contains clay from the upper part of the Brushy Basin Member of the Morrison Formation that contains about 90 percent bentonite. The geologic setting is about 200 ft lower stratigraphically than at the White Mesa Mill site. Ground water is present in a perched shallow system in the Dakota Sandstone and Burro Canyon Formations. It emerges in seeps at the base of the Burro Canyon Formation in the slopes of the canyon above the borrow area. Ground water directly beneath the borrow area is in the deeper artesian aquifer of the Entrada and Navajo Sandstones. A description of area resources is provided in Section 3.4.

This site is remotely located at the head of a broad, deeply dissected canyon. Composed of valley bottoms and steep hill slopes, the area is a colorful mix of gray, maroon, and pale-green rock strata that are dotted with dark-green piñon and juniper trees. BLM-managed land surrounding

this privately owned borrow area is designated Class III (Sweeten 2003). Because of its remote location, this site is not visible to the public.

Of the federally protected species that could be potentially present in the White Mesa Mill borrow area (Table 3–44), the Gunnison sage grouse, a federal candidate species, is of primary concern. The White Mesa Mill borrow area lies within the White Mesa Mill site which itself lies within a Gunnison sage grouse conservation area (Sage Grouse Working Group 2000). However, this species is not known to occur at the White Mesa Mill site (IUC 2003).

The cultural history of the on-site IUC borrow area is included in the more general cultural history of southeastern Utah described in Section 3.1.13.1.

Results of the Class I inventory (Davis et al. 2003) indicate that a Class III survey was conducted at this borrow area in 1980 as part of the larger cultural resource inventory of the White Mesa Mill site. Six cultural sites are documented within the boundaries of the borrow area. Of these, three sites are eligible for inclusion in the National Register of Historic Places. One is a Pueblo II (A.D. 900–1150) permanent habitation site, one is a permanent habitation site of indeterminate age, and one is a General Pueblo (A.D. 750–1300) limited activity site. The White Mesa Mill borrow area is an important plant gathering area for White Mesa Utes and is important to the traditional route from Allen Canyon/Cottonwood Wash area to the White Mesa community. Ongoing interviews with White Mesa elders have identified burial sites in the area. Recent interviews (Fritz 2004) with tribal members indicate that at least three potential traditional cultural properties associated with the Ute Tribe exist on or near the proposed borrow area. These are “potential” traditional cultural properties because their eligibility for National Register status has yet to be determined; this determination would be made during the Section 106 consultation process. In this area, the likelihood of occurrence of traditional cultural properties and their estimated density are extremely high (on a scale of low-medium-high-extremely high) and are likely associated with the Ute Tribe, Navajo Nation, and Hopi Tribe (Fritz 2004). Traditional cultural properties on or near the site may include sacred gathering areas, sacred ceremonial sites, sacred healing areas, sacred springs, and burial areas.

Neither background noise nor ground vibration data are available for this borrow area. Noise levels at this borrow area reside within the boundaries of the White Mesa Mill site. Background levels are expected to be comparable to noise levels associated with open desert areas, with some influence from existing White Mesa Mill operations that are centered about 1 mile to the north of the borrow area. These noise levels could approach 50 to 60 dBA at the borrow area as a result of operations at the White Mesa Mill facilities. US-191 passes about 1 mile to the east of the designated borrow area. Background noise levels at the site would be influenced by traffic on US-191. There are no rail lines near the borrow area.

### **3.6 References**

10 *Code of Federal Regulations* (CFR) 40, U.S. Nuclear Regulatory Commission, “Domestic Licensing of Source Material.”

10 CFR 100, U.S. Nuclear Regulatory Commission, “Reactor Site Criteria.”